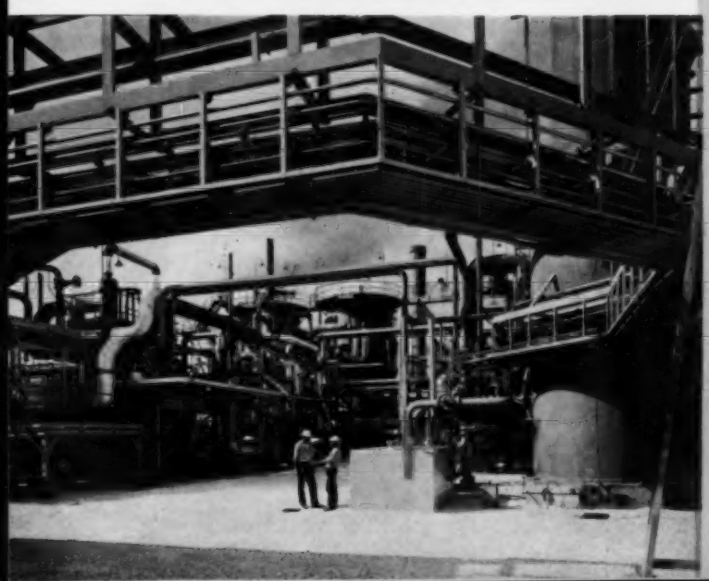
AGRICULTURAL CHEMICALS



In this issue:

Liquid Fertilizer Production
—reported at ACS meeting

New Dow Agricultural Research Center

Fertilizer and Pesticide Control
Officials in Washington

Arizona Fertilizer & Chemical Co.

Pesticide Laws in South America

Marketing Agricultural Chemicals

Livestock Insect Control

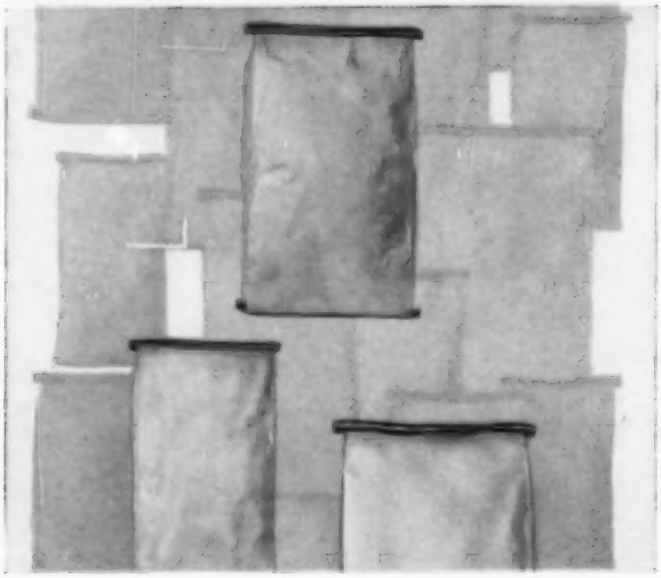
New Monsanto Ammonia Plant

AGRICULTURAL APPLICATOR SECTION

November 1960

in one year over 165 multiwall users reduced total packaging costs through UNION-CAMP's

SPECIFICATIONS CONTROL



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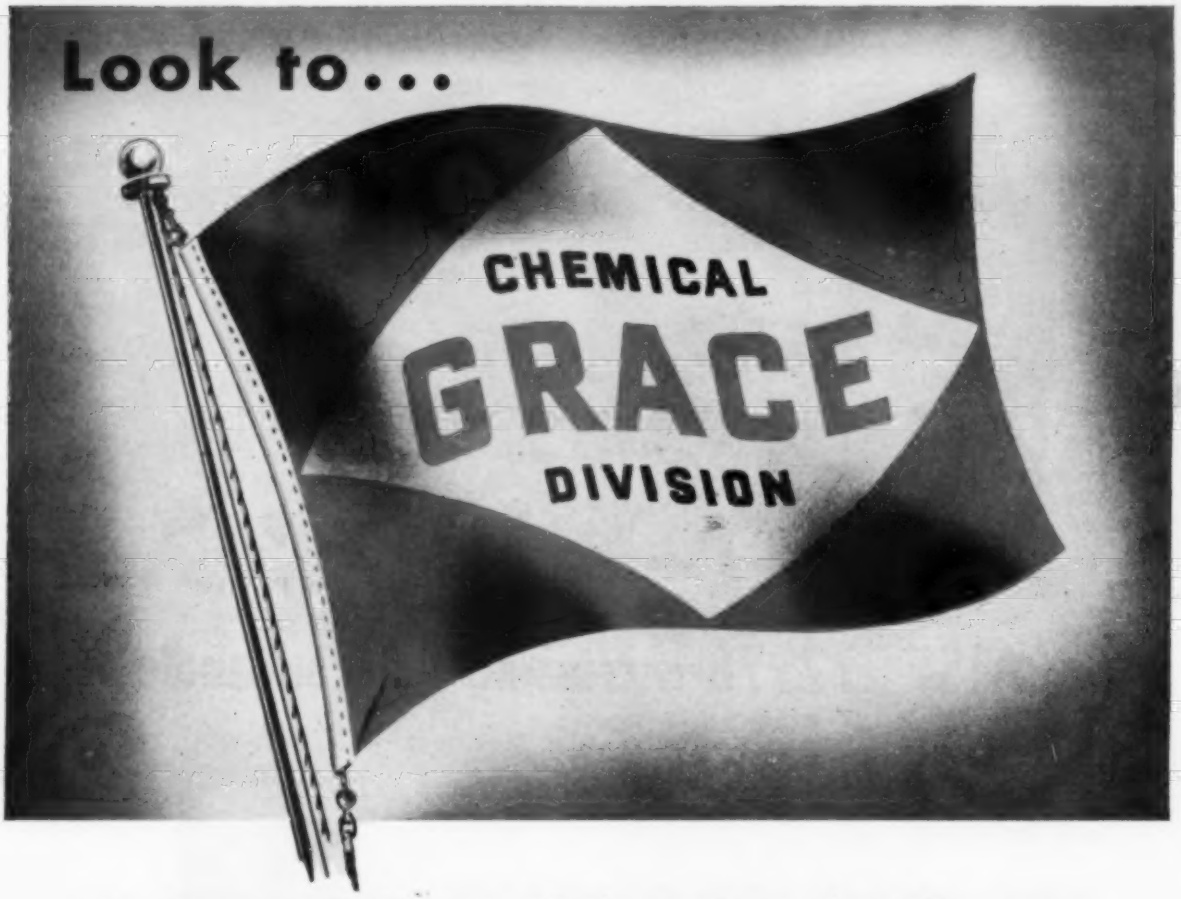

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This Month's Cover

Top Photo: New Agricultural Chemical Research Center in Midland Michigan, opened formally by Dow Chemical Co., October 17th. Story on page 74. Bottom Photo: Monsanto Chemical Co. holds seminar and tour at new computer-controlled ammonia plant in Luling, La. Story, page 78.

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AG CHEM

VOL. 15, No. 11 November, 1960

ARTICLES

ACS DISCUSSIONS COVER FERTILIZER TECHNOLOGY, PART II 28

PESTICIDE CONTROL OFFICIALS MEET 31

FERTILIZER CONTROL OFFICIALS MEET 32

LIVESTOCK INSECT CONTROL 33
by Arthur W. Lindquist

ARIZONA FERTILIZER AND CHEMICAL CO. 36

ASSOCIATION OF BRITISH MANUFACTURERS 39

POINT-OF-SALE MARKETING 40

MULTIWALL BAG DESIGN 42
by William L. Shoemaker

PESTICIDE LAWS OF CENTRAL AND SOUTH AMERICA 47
by Eugene J. Gerberg

FEATURES

IN THE SPOTLIGHT THIS MONTH 10

INDUSTRY CALENDAR 16

FERTILIZER VIEWS AND NEWS 51
by Vincent Sauchelli

PRODUCTION ROUND TABLE 52

THE AGRICULTURAL APPLICATOR 55

WASHINGTON REPORT 60
by Donald Lerch

THE LISTENING POST 64
by Paul Miller

PEST ROUNDUP 66
by Kelvin Dorward

INDUSTRY NEWS 71

PROFESSIONAL DIRECTORY 85

CLASSIFIED ADVERTISING 87

ADVERTISERS INDEX 89

TALE ENDS 90

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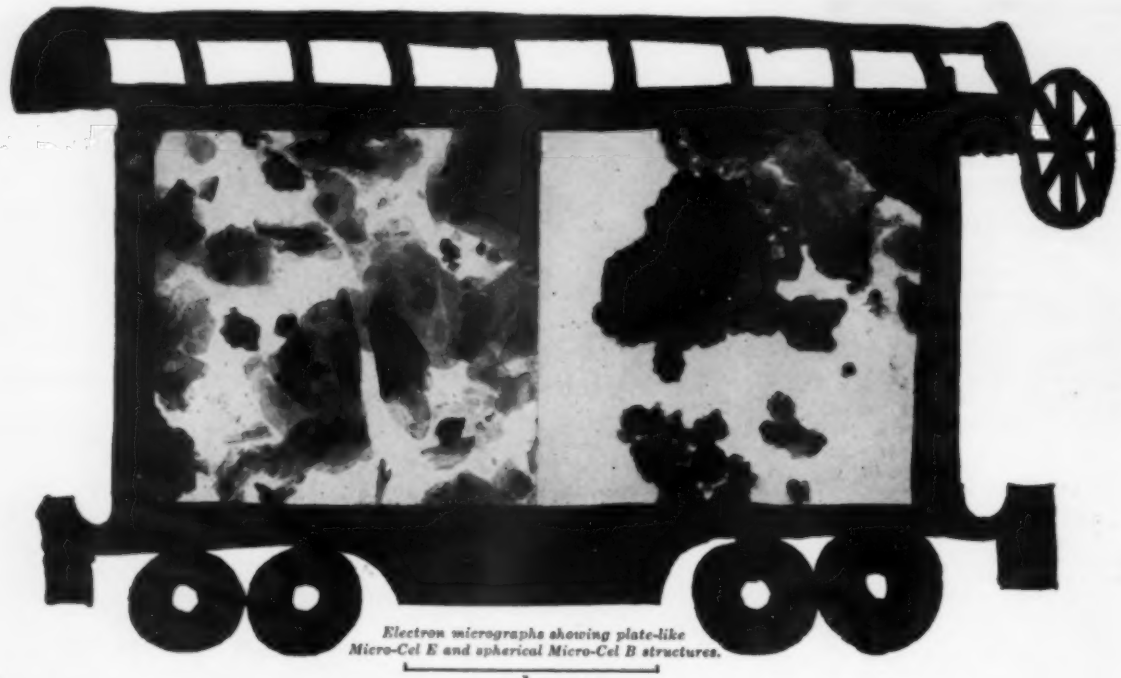

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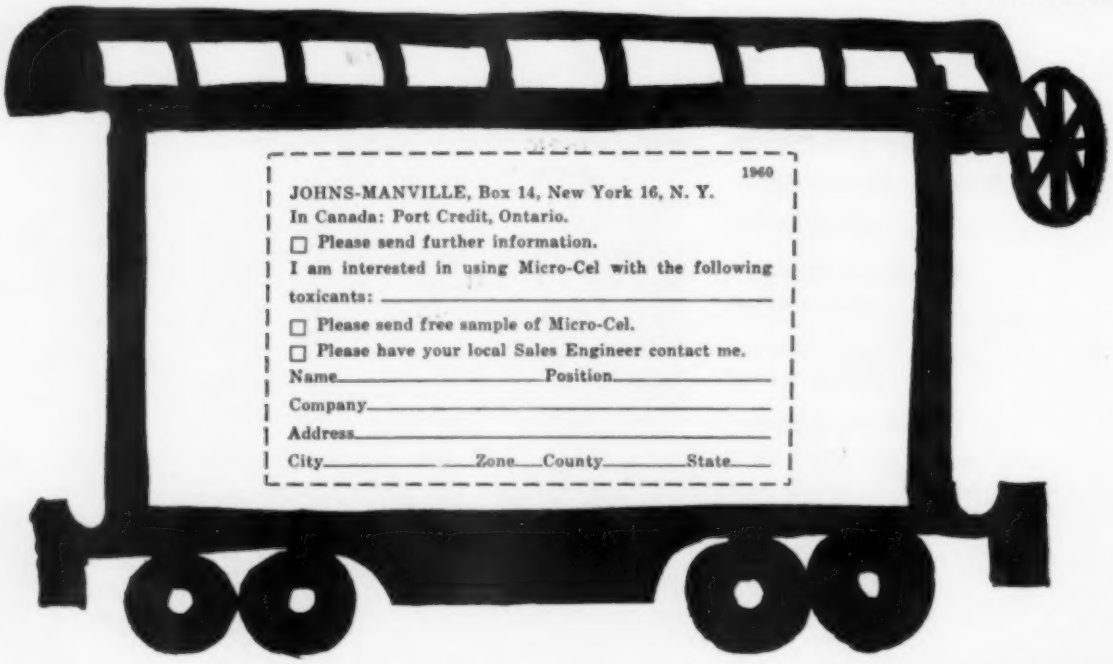

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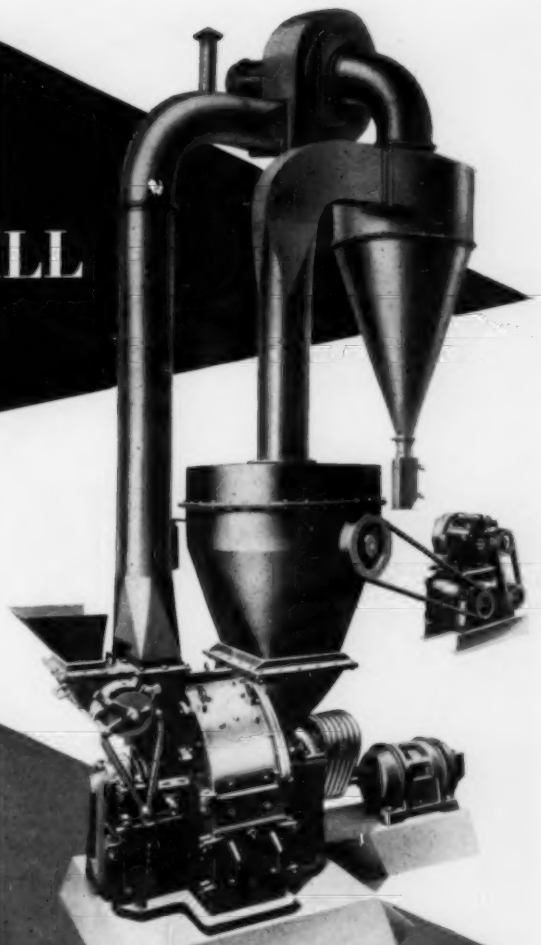

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National Agricultural Chemicals Association. Association Building. 1145 19th St., N.W., Washington, D. C. Lea Hitchner, exec. sec.

National Plant Food Institute. 1700 K St., N.W., Washington, D. C. Paul Truitt, president.

American Potash Institute. 1102 16th St. N.W., Washington 6, D. C. H B. Mann, president.

American Society of Agronomy. 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

American Phytopathological Society. S. E. A. McCallan, secretary. Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society. 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists. P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute. Hotel Claridge, Room 305, Memphis, Tenn. Jack Criswell, executive vice-president.

American Society of Agricultural Engineers. F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. Hugh Horn, secretary-treasurer.

California Fertilizer Association. Sidney Bierly, executive secretary, Room 213, Ochsner Building, 719 "K" Street, Sacramento, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City. Dr. H. W. Hamilton, secretary.

Entomological Society of America. 4603 Calvert Rd., College Park, Md. R. H. Nelson, secretary.

National Fertilizer Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

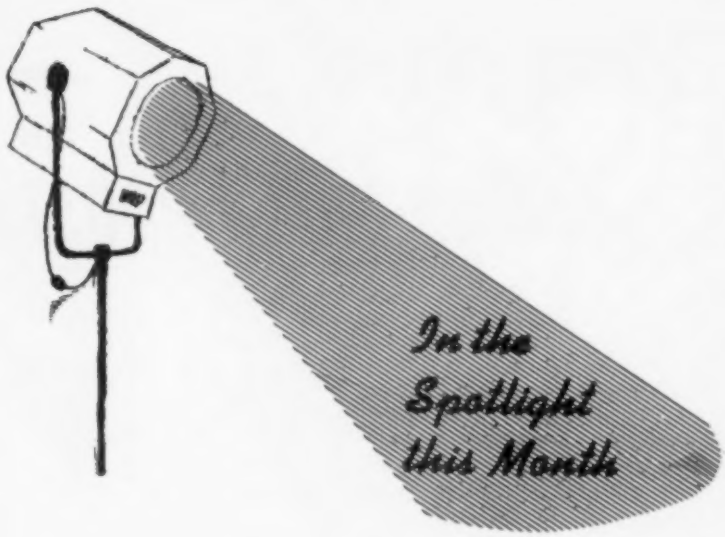
National Cotton Council, P. O. Box 9905, Memphis, Tenn.

Soil Science Society of America. 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

Sulphur Institute, 1725 K. St., N.W. Washington 6, D. C. Dr. Russell Coleman, president.

Weed Society of America. W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association. Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.



- **Liquid Fertilizers** . . . The most promising market for wet process phosphoric acid is in liquid fertilizer,—in view of new developments overcoming former limitations of wet process acid in this application. Techniques in manufacturing liquid fertilizers; ammoniation data; and elimination of sludge in wet process acid were among subjects considered in reports presented at Fertilizer Section of ACS national meeting. Page 28.

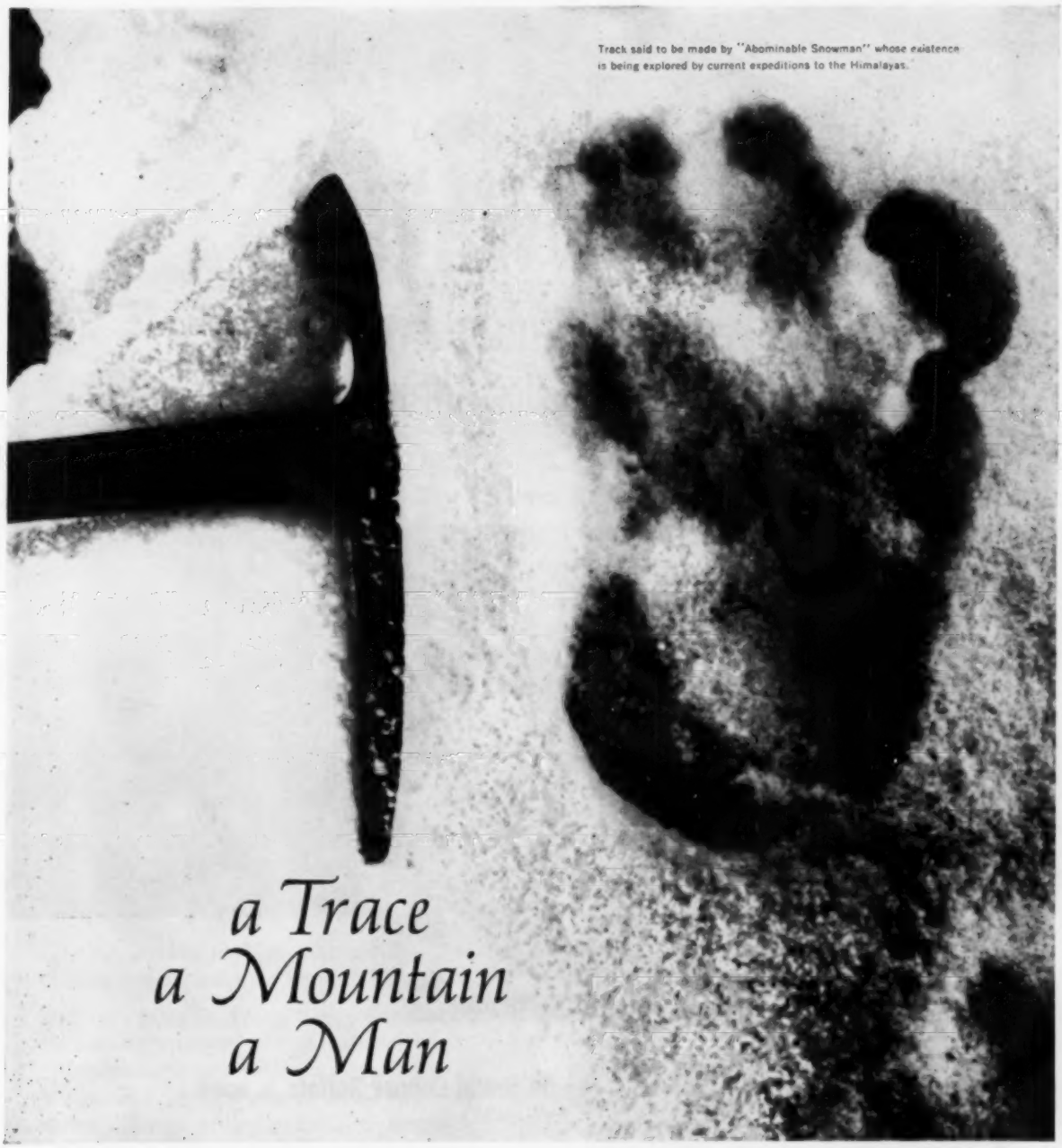
- **Livestock Insect Control** . . . Losses due to insect attacks on livestock have been estimated at about $600 million annually. Effective systemic pesticides are available for grub control; however systemics are not yet very effective for control of lice, biting flies and ticks. No material is yet available which is really effective in protecting cattle against mosquitoes, stable flies, horse flies. Page 33.

- **Bagging Fertilizers** . . . Since the present trend in shipping is to unit loads, there has been a marked move toward using the pasted valve, stepped-end type bag, since this design is more adaptable to a pallet than are sewn bags. Packaging design at Bagpak's new Research Center described. Page 42.

- **Pesticide Laws in S. A.** . . . A report on the pesticide laws of Central and South America, and the requirements they establish. Among requirements are: labels in Spanish, "Poison" identification, sometimes with skull and crossed bones; registration and licensing. Page 47.

- **Arizona Fertilizer** . . . Tracing its history to 1930, when it was the state's first and only fertilizer producer,—Arizona Fertilizer & Chemical Co. today manufactures pesticides as well as fertilizers and operates five subsidiary companies which produce liquid defoliants, liquid soil conditioners, and agricultural specialties. Page 36.

- **Home Garden Market** . . . Some new ideas on how home garden pesticides should be sold are related by Carbide's marketing specialists. Emphasis, they believe, should be on product identification and descriptive labeling. It's optimistic, they point out, to try to think the average gardener can select an effective pesticide for his specific problem from some half-dozen products offered. "Leave the technology to the experts," they suggest,—and develop the idea among users of product selection on the basis of a reliable brand name. Page 40.



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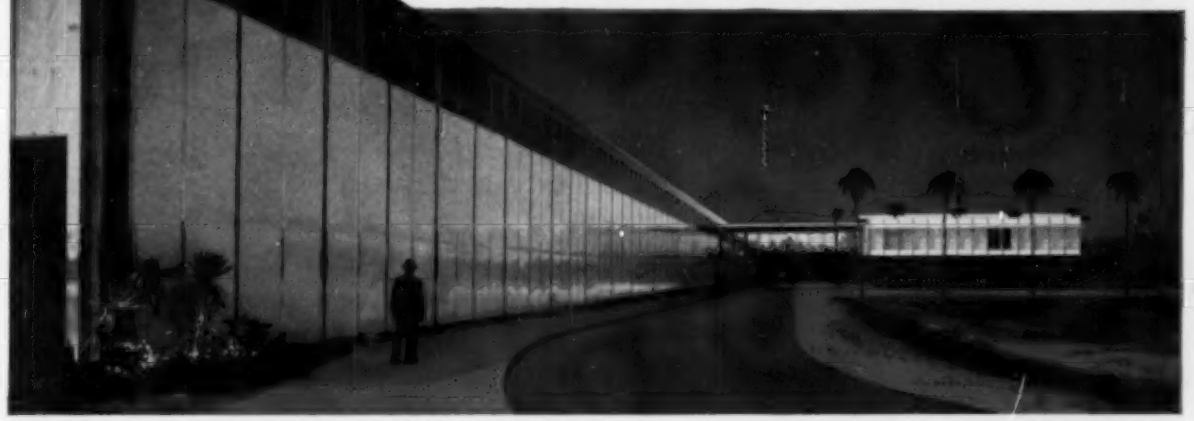

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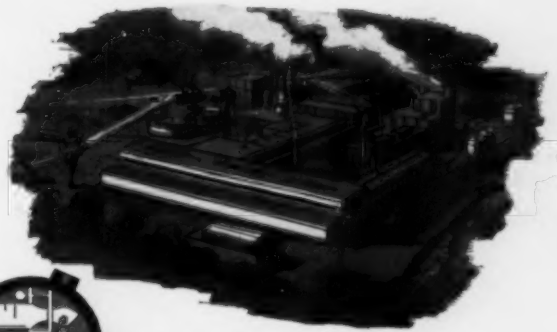

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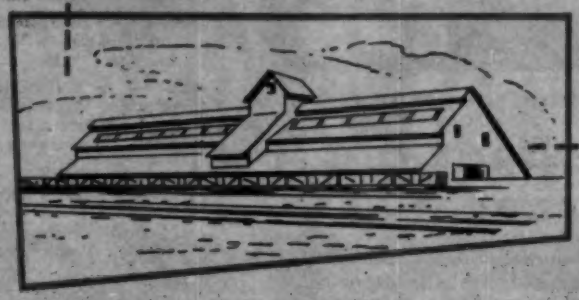

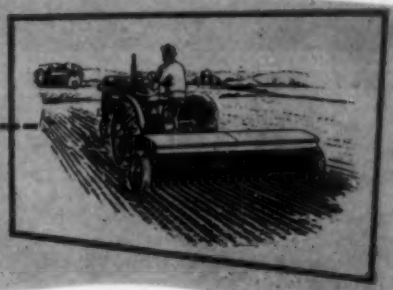

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INDUSTRY MEETING CALENDAR

Nov. 3-4—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 3-4 — Pacific Northwest Plant Food Assn., Annual Convention, Boise, Idaho.

Nov. 9-10 — Chemical Market Research Association, Pittsburgh Hilton Hotel, Pittsburgh, Pa.

Nov. 9-11—National Fertilizer Solutions Association, Annual Convention, Peabody Hotel, Memphis, Tenn.

Nov. 10-13 — Texas Aerial Applicators Association, Annual Convention, Echo Motor Hotel, Edinburg, Texas.

Nov. 13-15 — California Fertilizer Assn., del Coronado Hotel, Coronado, Calif.

Nov. 14 — Salesmen's Association of the American Chemical Industry, Annual Sales Clinic, Roosevelt Hotel, New York.

Nov. 14-19—Mexican Association of Insecticide and Fertilizer Manufacturers, annual convention, Merida, Yucatan, Mexico.

Nov. 21—South Carolina Plant Food Educational Society, annual meeting, Clemson House, Clemson Agricultural College, Clemson, S. C.

Nov. 28-30 — Soil & Crop Science Society of Florida, Annual Meeting, Fort Harrison Hotel, Clearwater, Fla.

Nov. 28-Dec. 1—Entomological Society of America, 8th Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J.

Nov. 29-Dec. 1 — New York State Nurserymen's Association, annual convention and trade exhibition, Concord Hotel, Kiamesha Lake, N. Y.

Nov. 30 — New Jersey annual fertilizer conference, Rutgers University, New Brunswick, N. J.

Dec. 5-7—Carolinas-Virginia Pesticide Formulators Assn. annual meeting, Carolina Hotel, Pinehurst, N. C.

Dec. 5-9—American Society of Agronomy, Annual Meeting, Morrison Hotel, Chicago.

Dec. 6-8—National Aviation Trades Association, annual convention, Oklahoma Biltmore Hotel, Oklahoma City, Oklahoma.

Dec. 12-14 — North Central Weed Control Conference, Hotel Schroeder, Milwaukee, Wis.

Jan. 4-6—Northeastern Weed Control Conference, Hotel New Yorker, New York.

Jan. 5-7 — California Aerial Applicators Association, 11th Annual Convention, El Dorado Hotel, Sacramento, Calif.

Jan. 10-11—Fertilizer Dealers Short Course and Fertilizer Industry Representatives Conference, Memorial Union, Iowa State University, Ames, Iowa.

Jan.12-13 — Arizona Aerial Applicators Association, 8th Annual Meeting, The Wigwam, Litchfield Park, Ariz.

Jan. 18-19—WACA Northwest Conference (formerly Northwest Agricultural Chemicals Industry Conf.) Benson Hotel, Portland, Ore.

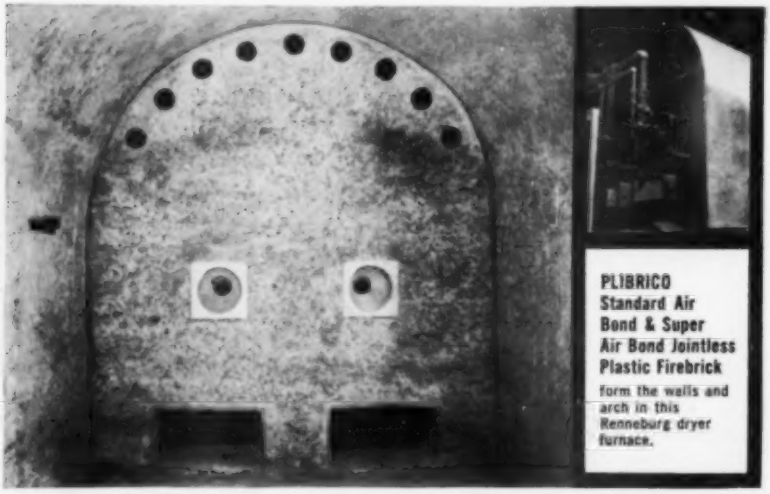
Jan. 18-20 — Southern Weed Conference, Hotel Soreno, St. Petersburg, Fla.

Jan. 19-21—Mississippi Aerial Applicators Association, annual convention, Buena Vista Hotel, Biloxi, Miss.

Jan. 23-25 — Southeastern Branch, Entomological Society of America, annual meeting, Admiral Semmes Hotel, Mobile, Ala.

Jan. 25-26 — TVA Symposium on "Effects of Environment on Crop Response to Fertilizers," Muscle Shoals, Ala.

Feb. 14-15 — Aquatic Weed Control Society, 2nd Annual Meeting, LaSalle Hotel, Chicago.



PLIBRICO Standard Air Bond & Super Air Bond Jointless Plastic Firebrick form the walls and arch in this Renneburg dryer furnace.

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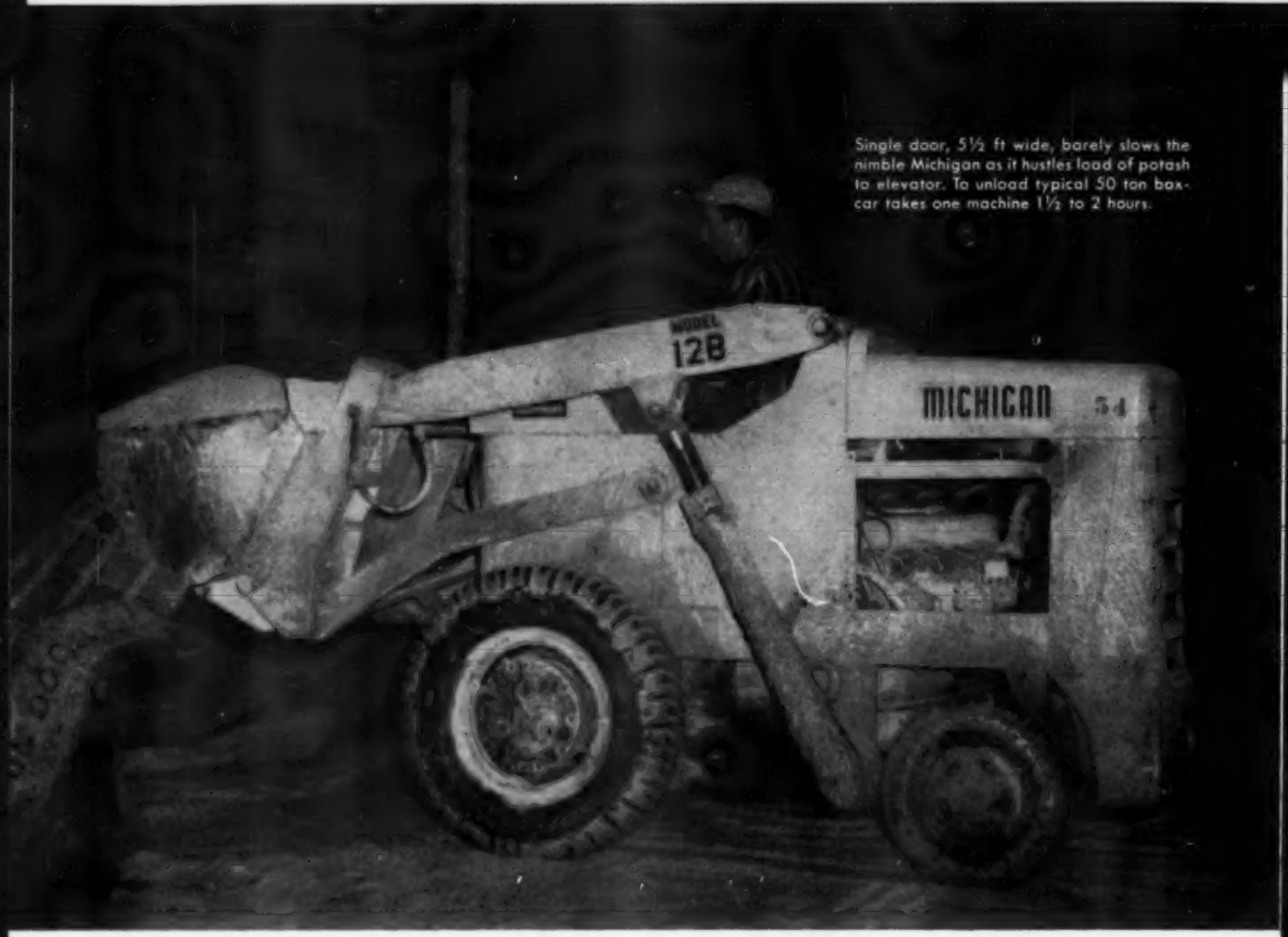

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The speaker is Monroe C. Suderman, production manager of the Streator (Illinois) plant of Smith-Douglass Company Inc, Norfolk, Virginia.

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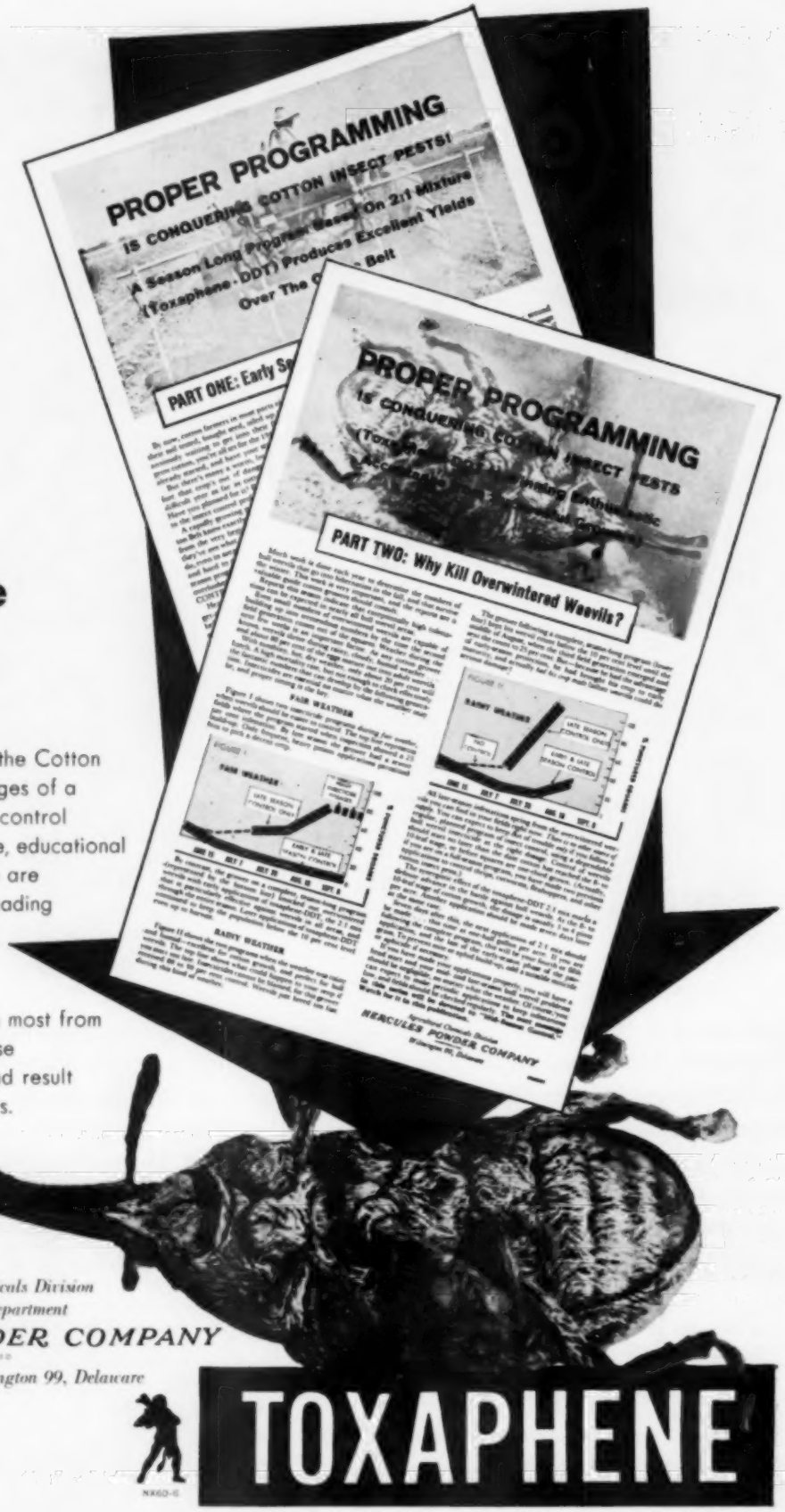

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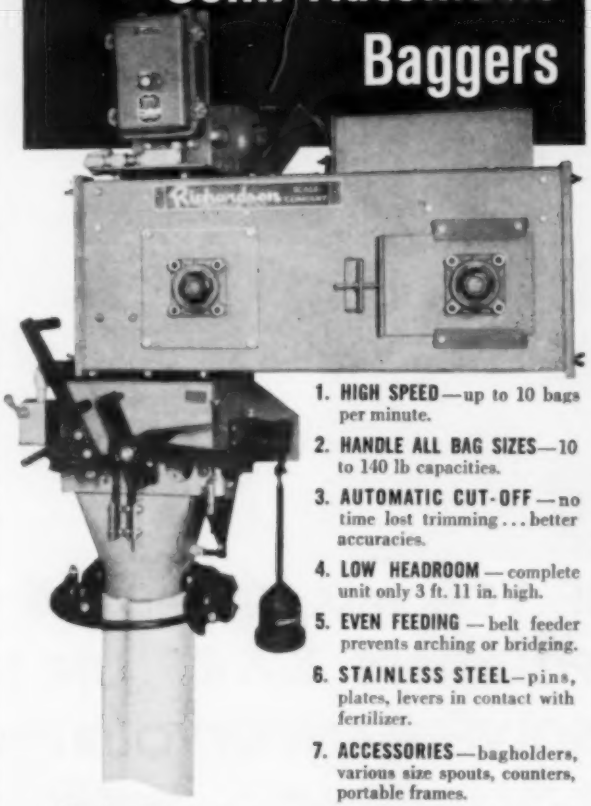

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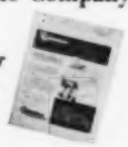

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This Cyanamid technician is checking the flow and quality of phosphate rock just before it goes into the cone where it is mixed with phosphoric acid to make Trebo-Phos Triple Superphosphate.

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EDITORIALS

TEN years ago a small nucleus of technical and production experts in the fertilizer industry got together for the first session of the Fertilizer Industry Round Table. A group of perhaps eighteen or twenty were present for the first series of discussions on fertilizer industry problems, to share their knowledge with one another in an attempt to find solutions for these common problems.

Because the Round Table met a need, and filled a niche which had been empty before, it has grown with the years. It is expected that perhaps five hundred fertilizer industry plant superintendents and production personnel will gather in Washington this month for the 10th annual Fertilizer Round Table. In this group will be some of the best brains and productive talent in the fertilizer industry.

The industry owes a debt of gratitude to those who started the Round Table, and who through their unselfish contributions have helped it grow to its present position as the major clearing house for dealing with fertilizer production problems. That thanks, along with the satisfaction of doing something worthwhile for the good of the industry, is all the compensation the organizers of the group have ever sought.

WE have heard several speakers recently, addressing audiences in the insecticide industry on the need for better channels of information to the public, who keep repeating the theme that the industry is "talking too much to itself." By this, we assume, they mean that there is nothing in particular to be gained by having a defense of pesticides presented before an audience of basic pesticide manufacturers, who already can be presumed to agree that insecticides are a boon to mankind rather than a menace. With this point we certainly agree.

If they mean, however, that producers of basic pesticides have already done an adequate job of giving the facts on new pesticides to everyone in the insecticide industry, and now have only to transmit this same story to the general public, we strongly disagree. As a matter of fact we don't feel that it is possible to make the long jump down from the basic producer to the end user, without first making sure that the bases in between have been touched. In our opinion, the channel of communications which starts with the basic producer of a toxicant must broaden and branch out in a major way through the intermediate phases of the industry, —the formulators, dealers, applicators, etc.— before the message will ever have a real opportunity to trickle down through to the general public. And one reason why the message has not been getting through to the general public, perhaps, is because we have been neglecting the intermediate steps.

It has been established in a number of studies that the insecticide buyer normally gets much of his information about the products he buys from his dealer, yet all too few insecticide manufacturers do anything to sell or educate the dealer. Nor do they make any real effort any longer to keep the formulator abreast of the new products they bring out. One brief announcement, and from this point on the formulator is left to try to dig out the story on the new product all by himself,—if he can find who makes it, that is. There has been even less done, if that is possible, in attempting to get

(*Continued on Page 79*)

Losses In Surface Applied Fertilizers

Surface-applied lime on pastures or other turf has a marked effect on the soil, and creates a thin calcareous layer that is sufficiently alkaline so that it may markedly increase loss of ammonia as compared with the same amount of lime mixed with the soil in the usual manner.

IN a discussion on the gaseous loss of ammonical nitrogen from surface applied nitrogenous fertilizers, Gaylord M. Volk, Florida Agricultural Experiment Station, reported.

Tests of efficiency of plant uptake of applied nitrogen generally show maximum recoveries between 50 and 75 per cent. If leaching losses and the buildup of fixed nitrogen in the soil are added, there still is an important portion of the nitrogen which cannot be accounted for, and must be assumed lost from the soil in gaseous form.

Dr. Volk addressed the fertilizer division of the 138th convention of the American Chemical Society, Sept. 11 to 15, in New York.

The volatile loss of ammonia following surface or shallow applications of ammoniacal materials to calcareous soils is well known. The bases in the soil, especially calcium, interchange with the ammonia in the applied material and allow a certain amount of it to escape to the atmosphere. The factor which has been overlooked in this regard is the effect of surface-applied lime on pastures or other turf. Lime so applied has a marked effect on the soil, and creates a thin calcareous layer that is sufficiently alkaline so that it may markedly increase loss of ammonia as compared with the same amount of lime mixed with the soil in the usual manner.

When urea is applied to the soil or turf, it is converted to ammonium carbonate within a few days by action of urease. The ammonium carbonate is unstable, and breaks down to give free ammonia, which if not immediately absorbed by the soil is lost to the atmosphere.

The volatile loss of NH_3 following surface application of nitrogen to bare soils or turf was measured by direct absorption of ammonia and crop response. Loss from urea in 7 days from 100 lb. N averaged 25%. Loss from NH_4NO_3 was negligible. Loss from pelleted urea on undisturbed soil under sod in 2 weeks was 29% for nonsurface limed soil, pH 5.9 and 36% where top limed with 1 ton per acre 4 months earlier. Losses from NH_4NO_3 were 0.3 and 3.4% respectively, and from $(NH_4)_2SO_4$ 0.4 and 19.7%.

Loss of NH_3 during 7 days following surface application of pelleted urea to moist bare soils ranged from 17 to 59% for acid soils, but loss from $(NH_4)_2SO_4$ was negligible. Greenhouse cropping of a field treated soil supported the general trend in data obtained by direct absorption of NH_3. Losses were greater from coarse pellets than from fine, and application to a freshly tilled soil produced greater loss than application after the surface was allowed to become dry. Dusting urea with $CuSO_4$ or $CaSO_4$ did not retard volatile loss.

Use of Wet Process Phosphoric Acids

"WET process phosphoric acid, first used in granular fertilizers in 1956 and in liquid fertilizers in 1957, has become a basic raw material in the mixed fertilizer industry," reported Daniel O. Walstad, American Cyanamid Co., in discussing use of wet process phosphoric acid in mixed fertilizers.

The corrosive nature of wet process acid, high viscosity and impurities (iron and aluminum phosphates, solids) have caused many difficulties in use of this acid in fertilizer manufacture. The problems have been studied, and minimized however: by selection and installation of suitable equipment for handling the acid; by modification of existing process equipment, and by development of new techniques of formulation and operation.

The two most common processes of making granulated fertilizer differ in the type of mixer used. In the pug mill, harder, stronger, and more regular prills are formed. The moisture and heat requirement is lower than in the TVA unit. However, in the pug mill it is impractical to distribute the acid under the bed of solids and therefore difficult to achieve higher ammoniation rates. Thus the potential of using wet phosphoric acid in the pug mill mixer is limited.

In the TVA mixer, both the ammonia and acid spargers are located so that the materials

are injected under the bed of solids, where actual ammoniation takes place. Maximum ammoniation rates can be achieved, and the full value of wet process phosphoric acid can be realized.

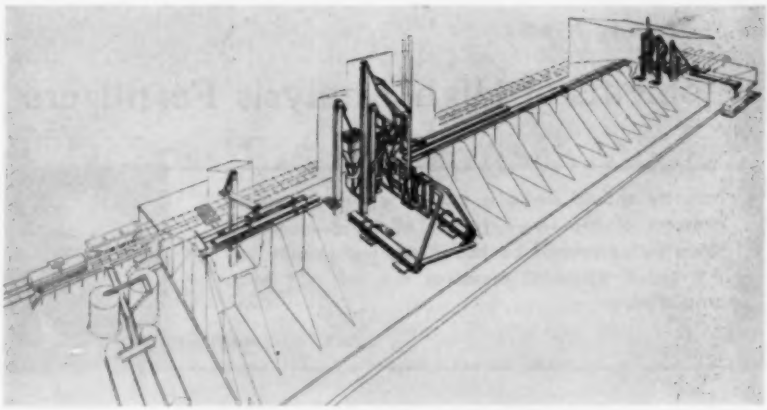
The most promising market for wet process acid, however, reported Mr. Walstad, is in liquid fertilizer manufacture. New techniques have been developed which overcome some of the limitations of this source of phosphoric acid. Impurities which precipitate and clog application equipment have been among the major drawbacks, but, according to the speaker, use of "polykrome" at American Cyanamid plants has been partially effective in settling the solids in the liquids.

Four techniques in manufacturing liquid fertilizers using wet process phosphoric acid were reviewed as follows:

1. Applying the liquid fertilizer to crops as soon as it is made, and before the solids have had a chance to settle.
2. TVA method, which is considered the least costly of the four methods, and depends on controlled ammoniation to obtain a colloidal precipitate. The pH of the liquid is kept at 8.0 during neutralization, then brought to 6.6. The temperature is kept below 175°F.
3. Adding a sequestering agent, —a polyphosphate.
4. Making a colloidal precipitate using a clay. The cost of clay and special techniques involved in this process have prevented most manufacturers from using this method.

Mr. Walstad pointed out that in a continuous plant, all four of the methods can be used satisfactorily;—in a batch operation, the preference is to make a liquid fertilizer and spread it immediately.

Part I of this report on the 138th ACS meeting appears on pages 38-40 in the October "Agricultural Chemicals."



A modern granular fertilizer plant

Operational Phase Of A Modern Plant

EACH operational phase of a modern fertilizer plant was described by Walter J. Sackett, Jr., and Walter J. Sackett, Sr., with the aid of slides. The plant described is a modern granular fertilizer plant having an annual production capacity of 75,000 tons. It recently was completed by the A. J. Sackett and Sons Co., Baltimore, for Cooperative Fertilizer Service, Inc., at Russellville, Kentucky.

The storage building accommodates some 12,000 tons of materials. Raw materials are fed to a multiple compartment compounding system from which point they are properly classified and blended, and then they are moved to the continuous ammoniating and granulating process. Continuous material flows from the weigher to a combination unit consisting of a TVA ammoniator and a Sackett Star granulator. After treatment in the ammoniator, the material passes to the granulator.

Pelletized material from the granulator enters the dryer and then flows on to a belt conveyor to the cooler, which is a rotary countercurrent unit. Fines separated by the double-deck vibrating screen and cyclones are recycled, the over-size is crushed and the on-size product is transferred for storage and shipment.

The plant designed for Cooperative Fertilizer Service contains provisions for the shipment of products in either packaged or bulk form. About twenty-five men are required for the overall operation. The product capacity of the granulation unit, Mr. Sackett reported, is 25 tons per hour.

Wet Process Phosphoric Acid Production

IN a further discussion of liquid fertilizers from wet-process phosphoric acid, a report prepared by A. V. Slack and M. C. Nason, TVA, pointed out that the best temperature for ammoniation is 160° F.;—that products made at higher temperatures tend to settle more rapidly and that the unsuspended solids are more difficult to disperse. Settling rates are decreased, stated Mr. Nason in presenting the report, by adding one to two per cent by weight of a swelling-type clay, or by ammoniating at a high pH (8.0), then adjusting to normal pH (6.7) for storage. Growth of struvite (a magnesium ammonium hexaphosphate hydrate) crystals is inhibited by quick cooling to room temperature and by carrying out the ammoniation at a low pH (6.0); however, by the latter method, the settling rates are increased appreciably.

(Continued on Page 79)

ACS Meeting Report

Problems of High Analysis Fertilizers

Industry should make a special effort to remind growers of the importance of trace elements; since yields cannot be increased, nor quality improved, if essential elements are left out of a crop diet.

Jackson B. Hester

THE very significant technological advances in fertilizer manufacture in recent years have resulted in economies to the manufacturer, and the availability of a convenient form of fertilizer to the user, observed J. B. Hester, Sr., consultant and researcher of the Jackson B. Hester Agricultural Research Laboratories. While production and research men were working toward these achievements, however, they lost sight of the requirements of plant life . . . the actual consumer of plant foods. The technological changes have occasionally resulted in problems for commercial growers, some of whom are not yet aware of these problems.

Some of the problems resulting from high analysis fertilizers are: rapid changes in soil acidity, depletion of calcium, magnesium, sulfur, and other trace elements from the soil, causing injury to seed germination and transplanted plants. The trend toward highly soluble materials increases the salt concentration in the soil. These highly soluble materials are then readily leached from the soil, reducing plant nutrient content. The increase in solubility presents another problem. Toxic elements such as aluminum, arsenic, and others are converted into soluble salts, which may cause plant poisoning.

Soil acidity (pH) has been found to vary from 3.9 to well above 7.0. Mr. Hester observed that in light soils found on the Eastern Seaboard, the pH value changes with heavy applications of high analysis fertilizer as much as two points (6.0 to 4.0). The less the soil is buffered, he said, the greater the change. These great changes, when not recognized and taken into consideration, have resulted in greatly reduced crop yields.

It is not uncommon for the soils on the Eastern Seaboard to analyze as low as 500 pounds of replaceable calcium. Thus, the introduction of 1,000 pounds of a 20-20-20 fertilizer on such soils would require practically all of the calcium present to neutralize the acidity resulting from the fertilizer added. The changes in the calcium content of the soil due to plant absorption and leaching must be taken into consideration by the grower, and corrections made for the maintenance of crop yield.

There are many soils, reported by Mr. Hester, where the magnesium content has reached a very critical concentration, which may make soils deficient in magnesium for some crops. The introduction of synthetic fertilizer materials has been a definite factor in creating this magnesium deficiency. Sulfur deficiencies are still another growing mineral loss in some areas, particularly where crops such as wheat and soybeans are grown (these crops requiring adequate sulfur in their diet for satisfactory growth). Boron is important in growth of potatoes, and zinc, molybdenum, copper, and manganese are essential in other crop diets. A regular soil analysis, and careful and intelligent fertilization (including application of essential trace elements), have become very important phases of a grower's program in crop production. Industry should make a special effort to remind growers of the importance of trace elements,—since yields cannot be increased, and quality will not be improved if essential trace elements are left out of a crop diet . . . no matter how much fertilizer is applied, the speaker reminded.

Operations Report on Kimberley Plant

H. A. Howard of Consolidated Mining and Smelting Co. of Canada, Ltd. reported on fertilizer operations at the Kimberley, B. C. plant, which was installed in 1953 to produce 70,000 tons of mono ammonium fertilizer (11-48-0) annually, using iron sulphide concentrate (primarily pyrrhotite) as the source of sulphur, phosphate rock from Garrison, Mont. and ammonia, shipped by tank car from Cominco's ammonia plant at Calgary, Alberta.

Roasting is carried out in two Cominco suspension roasters, and acid is produced in a single Monsanto type contact plant rated at 270 tons of 100 per cent sulphuric acid per day. The Dorr type phosphate plant consists of one phosphoric acid circuit designed to treat 325 tons phosphate rock per day, and one fertilizer unit rated at 200 tons per day of 11-48-0 ammonium phosphate fertilizer. Bulk storage is provided for 35,000 tons of product, with bagging and bulk shipping facilities.

Ample ventilation and atmospheric pollution control are provided by the installation of adequate gas scrubbing facilities. The Doyle impingement scrubber is used extensively to clean up exhaust gases.

Pesticide Officials Discuss Registration of Mixes

14th Annual Meeting Also Considers Enforcement of Residue Regulations and Misuse of Pesticide Products. E. R. Winterle is Elected President

THE public has a very hazy idea of the laws and regulations governing the use of pesticides, J. D. Patterson, chief chemist, Department of Agriculture, Salem, Oregon, told the 14th annual convention of the Association of American Pesticide Control Officials, October 11 to 13, at the Shoreham Hotel, Washington, D.C. Dr. Patterson spoke as the outgoing president of the association.

Proper communication between agencies of the government is a must, he said, if pesticide officials are to maintain the confidence of the public. If officials in the Department of Agriculture are not forewarned of a move, by another branch of the government, that will involve pesticides, he pointed out, they may be unable to provide prompt statements that might allay fears of the public. This, Dr. Patterson said, results in confusion and a loss of confidence in control agencies and public health agencies. He added, however, that this condition is improving.

Dr. Patterson was succeeded as president of the association by E. R. Winterle, Tallahassee, Fla. R. H. Guntert, Topeka, Kansas, was elected vice-president, Paul E. Irwin, Richmond, Va., was elected secretary and A. B. Heagy, College Park, Md., was re-elected treasurer. Named to the executive committee were C. P. Osgood, Augusta, Maine, and R. Z. Rollins, Sacramento, Calif.

In a meeting of the workshop committee, it was brought out that farmers will, in some instances, ask a fertilizer mixer to include pesticides in his mix. The question raised was, should each individual mix be registered separately? To this question, there seemed to be general agreement that most states do require each product to be registered separately. Some states, however, do not permit the sale of any pesticides unless they are in a registered container.

Another unusual problem that was brought to the attention of the control officials was the sale of products that contain a pesticide yet make no claims on their label as being a pesticide. Examples of this type of product are the candles containing a mosquito repellent, and tree-wound paint that contains fungicides. In the opinion of some officials, such products are not worth registering unless they state on the label that insects and/or fungi are controlled. Other states feel that if there is a pesticide in the product, it must be registered, unless the manufacturer claims that the pesticide is there for reasons other than controlling insects.

The disposition of pesticides on which the registration has expired seems to depend upon whose hands the product is in. If the insecticide was properly registered when it was placed in the hands of the retail dealer, and, for one reason or another, the registration has expired, the dealer is given reasonable time in which to dispose of the packages. If the product is in the hands of a wholesaler, however, it must, in most cases, be re-registered.

The problem of pesticide residues in milk and meat was brought up during the convention. It was generally agreed that most cases of residue are caused by misuse of pesticides. The officials went on to say, however, that more people are reading the label now than ever before because of the danger of losing their crop at the end of the season because of residues. In many instances, food processors will not handle a crop unless they know what chemicals were used during the growing season, and at what rates.

Besides impressing on farmers the fact that they must use pesticides properly, there is a need for insuring that they do not use contaminated feed. This is especially true in California, it was brought out, because of the great drift problem there, brought about by the practice of growing different crops in close proximity. There also is a shortage of grazing land. Because of these factors, authorities in California have permitted feed containing up to ½ ppm. of DDT to be fed to dairy cattle. This does not leave a residue in milk, according to the California representatives.

The question of whether registration numbers should be required to appear on pesticide packages was met with a wide variety of opinion. Some control officials felt that such a requirement would be a good idea and may, in fact, be

(*Continued on Page* 79)

Close Supervision Of Specialty Fertilizers Urged

Unscrupulous Lawn Food Salesmen Can Reflect Discredit Upon Industry In Eyes of Inexperienced Gardeners, Fertilizer Control Officials Told by S. B. Randle

THE efficiency of American agriculture is not due to a few practices, such as fertilization, irrigation, or insect control, rather it is due to a combination of many practices in such a way that each practice supports the other, Dr. Charles E. Kellogg, U. S. Department of Agriculture, Washington, D. C., told the 14th annual convention of the Association of American Fertilizer Control Officials, Oct. 14, at the Shoreham Hotel, Washington, D. C.

Dr. Kellogg added, however, that the United States could not have experienced anything like the improvements in crop production during the past 30 years without fertilizers. Fertilizer cannot claim all the credit, of course, he said. It takes a favorable combination of many circumstances to produce even a fair corn crop, Dr. Kellogg pointed out.

Four factors are involved in the production of a good harvest, according to Dr. Kellogg. They are: proper balance of nutrients in the soil, adequate air and water to the root zone, proper crops for the soil types, and appropriate insect protection. The fertilizer industry, he declared, must see that everything is done properly by the farmer if it expects to sell more fertilizer.

The problem of home owners who know nothing about fertilizers was brought out by Stacy B. Randle, New Brunswick, N. J., outgoing president of the association, who said that they are legal prey to anything represented as fertilizer. These people, he said, need information about fertilizers —how to use them, and what they do.

The fertilizer industry, Dr. Randle said, must protect itself against unscrupulous plant food manufacturers and door-to-door lawn food salesmen who represent, in the eyes of home owners, the fertilizer industry. Dr. Randle urged fertilizer control officials to study the labels for specialty fertilizers and disallow any that contain false claims. There must be an improvement, he warned, in the practices of advertising and labelling specialty fertilizers if the home gardeners are not to lose all confidence in the fertilizer industry.

One of the greatest problems associated with a soil testing service is financing, Dr. Ralph L. Wehunt, Tennessee Valley Authority, Knoxville, told the association. Some states, he said, now require that the farmer pay a small fee for having his soil tested.

Another problem cited by Dr. Wehunt is the seasonal rush of soil samples to be analyzed. This is unnecessary, he said, because soil samples can be taken at any time during the year. He called for an educational program that would influence farmers to take samples in the fall.

To be successful, Dr. Wehunt declared, a fertilizer program must meet each farmer's ability as an operator. It does no good, he pointed out, to provide a 100 per cent fertility program to a farmer who uses only a 50 per cent management program. The farmer's over-all practices must be improved, he concluded.

Charles V. Marshall, Ottawa, Canada, was elected president of the association for 1961 and J. W. Kuzmeski, Amherst, Mass., was elected vice president. Bruce D. Cloaninger, Clemson, S. C., was re-elected secretary-treasurer. In addition, H. J. Fisher, New Haven, Conn., and W. L. Baker, Columbus, Mo., were named to the executive committee.

The group's States Relations Committee met during the course of the convention to consider a variety of topics. Among the conclusions drawn were two pertaining to fertilizer statistics. It was felt that additional information on consumption of fertilizers by counties and about grades and types of fertilizers used would be of great benefit to the fertilizer industry. In line with this was a recognition of the need for all states to report on a semi-annual basis. It was felt that, in this way, the most benefit would result from fertilizer use statistics.

Another item that was discussed was the use of pictures and promotional or sales material on the labels of specialty fertilizers. Among the objections raised were that the pictures sometimes obscure the analysis of the product and they may be misleading to the con-

(*Continued on Page* 79)

Livestock Insect Control

A conservative estimate of annual losses caused by direct insect attacks on livestock is $600 million (which figure, incidentally, also has been given as an estimate of the total dollar volume, on the retail level, of the business done by the entire pesticide industry).

Current programs directed toward reducing losses caused by insects have resulted in the development of several promising livestock insect control chemicals. Two major problems are resistance to insecticides and the threat of residues in meat and milk.

By Arthur W. Lindquist
Entomology Research Division,
Agr. Res. Serv., U. S. D. A.

FROM a long-range viewpoint, the maintenance of an ample supply of high quality and nutritious food is of vital importance to American citizens. It may seem unrealistic to consider increased supplies when heavy surpluses of some foods are currently present. However, if needs are studied, especially those of meat and milk for an expanding U. S. population, it is obvious that long-range plans must be made to meet the requirements, 5, 10, or 20 years hence.

Today, Americans consume about 160 pounds of meat per person per year. This rate may increase as income rises. The important point, however, is that the United States population is now expanding at a rate of three to four million persons per year. The current 178.5 million may increase to over 200 million in 5 years, or by 1965. Some estimates predict about 250 million people within 10 or 12 years. If Americans are to maintain their present consumption of meat and milk, livestock production must increase proportionately to provide the food demands of this nation.

There is not much extra land available to increase food production, especially for livestock. The large western livestock ranges are being utilized to about full capacity. In addition, 1½ million acres of land are being converted to highways, factories, airfields, and suburban developments each year.

One sure way to increase production of livestock economically is to control insects that plague animals and carry animal diseases. Furthermore, if the livestock grower is to prosper he must find ways of increasing profit margins in the production of meat and milk animals. This can be accomplished in part by control of insects. It is also to be expected that meat and milk production will increase because of better strains of livestock, animals selected for good food utilization, and improved animal feeds.

Insects as Enemies of Livestock

All of our domestic livestock are subject to attack by many kinds of insects throughout the year. During the summer, they are molested by biting flies, mosquitoes, ticks, and screw-worms. Even during the winter, animals are usually infested with lice, mites, cattle grubs, and some ticks. This constant irritation and blood loss reduce weight gains and milk production.

Losses due to direct insect attack on livestock have been conservatively estimated at about $600 million annually. This figure does not include damage by diseases carried by insects. Precise data on losses of meat and milk caused by insects are not available, but published and other records suggest that the estimates are conservative. Why is not more information available? Insect damage to animals is usually much more difficult to measure than that to plants. For example, it is difficult for the layman, and even for livestock specialists for that matter, to perceive weight losses or gains of 50 to 75 pounds in 3 to 4 months in cattle. To detect and measure small or moderate differences in the

weights of infested animals and those protected from insects requires costly and carefully controlled experiments conducted over several months to a year or more. Furthermore, we do not have methods of adequately protecting livestock from some insects, such as the stable fly and horse fly, in order to conduct clearcut, comparative field experiments. Finally, livestockmen, being rugged individualists, have considered that some insects, at least, do not cause appreciable damage or loss, which may account for their unwillingness to use insecticides and for the lack of encouragement and support of further research on these problems. However, an awareness that insects are indeed expensive liabilities is increasing among growers and all of the livestock industry.

The importance of the industry in the United States is reflected in the fact that cash received by the farmer for livestock, plus that for human consumption, totals approximately $18 billion annually, compared with about $14 billion for all plant crops.

Examples of Progress

WHERE do we stand today in the control of insects affecting livestock? Let us report first our best progress. The discovery by our Kerrville, Texas, and Corvallis, Oregon, laboratories of the systemic properties of ronnel (Trolene) and Co-Ral (Bayer 21/199)* marked a major breakthrough in studies on cattle grub control. This research accomplishment was due primarily to a team approach involving the combined efforts of entomologists, chemists, veterinarians, insect and animal physiologists, plus imaginative and capable leadership at our two large laboratories. Extensive research by State, Federal, and industrial entomologists since 1955 has demonstrated the practical effectiveness of these two systemic insecticides in controlling our most serious cattle pest, the cattle grub. We are now searching for better and safer systemics. If they are found, serious consideration can be given to programs to eradicate the cattle grub, essentially a one-host insect, from the United States, Canada, and Mexico.

The new insecticide known as Ruelene** has shown exceptional promise as a systemic for grub control. Recent research by W. H. Rogoff of South Dakota State College and others has shown that this insecticide applied as a concentrate on the backs of cattle by a "pour method" will provide 98 to 100 per cent control. This method is more effective than the same amount of active ingredient applied as a dilute mixture in high-pressure sprays. A concentrated oil solution of Co-Ral administered in volumes of 100 to 200 ml. to the backs of cattle has shown high efficiency in grub control in recent experiments at Kerrville, Texas. Simple methods of application may revolutionize cattle grub control and could be key factors to eradication.

Screening programs by industry and our Kerrville, Texas, laboratory to find new, more effective, and safer systemic insecticides are progressing. A number of promising compounds are currently in various stages of testing, and several may prove superior to those now in use.

As yet, systemic insecticides are not very effective for the control of lice, biting flies, and ticks. Most of the organophosphorus systemics, following a single treatment, are eliminated from the animal body in a day or two so that effectiveness against biting flies, lice, and ticks is limited. It is possible, however, that continuous low-level feeding of some of the materials will provide effective kill of biting flies and mosquitoes. Research is looking toward the finding of such compounds. There is also a need for insecticides that can be added to feed, salt, or water to prevent breeding of the horn fly, face fly, and house fly in the droppings of animals. Meanwhile the conventional sprays must be used for the control of these insects.

Research has developed excellent insecticide treatments for louse control on beef cattle. These include sprays of toxaphene, lindane, Co-Ral, ronnel, methoxychlor, and malathion. The last two do not require a holding period between treatment and slaughter, whereas the others require 28 to 56 days in order to meet legal tolerances. All are used as 0.5 per cent sprays except lindane, which is recommended at 0.03 per cent. All, except methoxychlor, are also recommended for the control of ticks on beef cattle. With the exception of lindane, they are also recommended for the horn fly, one of our most costly livestock insects, which if uncontrolled may build up infestations of several thousand per animal. In addition to conventional sprays, backrubbers impregnated with DDT or toxaphene are useful treatment devices.

The control of lice on sheep, goats, and hogs can be accomplished economically with any of several insecticides. Usually only one treatment is needed, but two treatments will eradicate this pest in most groups of animals.

Another item of progress concerns screw-worm control and eradication by means of the sterile-male technique. Laboratory research at Kerrville in 1951 demonstrated that the introduction of sexually sterile males into a population of normal males and females at a ratio of 10:1:1 resulted in 80 to 85 per cent of the egg masses produced being infertile. Continued introduction of sterile males reduced the population to the vanishing point. Field tests demonstrated that the method was practical, and actual elimination of the screw-worm was attained on the isolated island of Curacao. A large field test was conducted in late 1957 to perfect the method of rearing, sterilizing, and releasing a maximum of about 50 million flies per week over peninsular Florida. The State of Florida and the U. S.

*O-(3-chloro-4-methylumbelliferone) *O,O*-diethyl phosphorothioate

**4-*tert*-butyl-2-chlorophenyl methyl methylphosphoramidate

Department of Agriculture joined in a multimillion-dollar program in 1957 for the eradication of the screw-worm from the Southeast. This program was spectacularly successful, since no screw-worms have been found in the southeastern states since the spring of 1959. The savings to the livestock industry will amount to many millions of dollars annually.

Problems of Control

IN spite of the years of screening and evaluating thousands of organic and chemical compounds, we have nothing that is very effective in protecting cattle against mosquitoes, stable flies, horse flies, and deer flies. Many insecticides, mainly of the chlorinated hydrocarbon and organophosphorus groups, will kill the flies attempting to take a blood meal on cattle during 1 to 3 days after application, but these compounds do not repel and do not offer much protection to animals. The best recommendation available for protecting cattle against the stable flies, mosquitoes, and tabanids is treatment with pyrethrum preparations. Several proprietary compounds are used with pyrethrins to act as fly repellents and to enhance their effectiveness. Under these conditions cattle are protected up to about 3 days. This type of treatment is not practical for range animals or for any animals that cannot be corralled and treated every few days.

The development of insecticides that do not secrete in the milk of lactating dairy cattle has been a formidable problem and still is unsolved. Most of the chlorinated hydrocarbon sprays show up in milk a few hours after treatment and do not disappear for several weeks. The organophosphorus insecticides appear rapidly in the milk after treatment of cows but disappear in a few days. For example, 0.5 per cent malathion sprays caused about 0.11 p.p.m. in the milk 5 hours after treatment, but none could be detected after 2 days.

Where Do We Stand?

1) Ruelene has shown exceptional promise as a systemic for grub control.

2) Systemics are not yet effective for control of lice, biting flies, and ticks.

3) Sprays of toxaphene, lindane, Co-Ral, ronnel, methoxychlor, and malathion are excellent for louse control on beef cattle. All except methoxychlor are suggested for tick control on beef cattle.

4) Many insecticides of the chlorinated hydrocarbon and organophosphorus groups will kill the flies attempting to take a blood meal on cattle, one to three days after application, but these compounds do not repel, and do not offer much protection to animals.

5) Development of insecticides that do not secrete in milk of lactating dairy chemicals has been a formidable problem, and still is unsolved.

6) Experiments with smears containing Dipterex, DDVP, malathion, and dimethoate to the face of livestock have provided promising results in the control of face flies. Drawback to these preparations is the necessity for almost daily applications.

Small quantities of either methoxychlor or malathion applied in dusts by hand over the backs of cattle do not appear in the milk and provide effective control of the horn fly for about three weeks. The development of the hand-dusting treatments and registration and recommendations of methoxychlor and malathion have proved a boon, and in some states up to 85 per cent of the dairy farmers use this treatment. The big weakness of the dust treatment is that it is not effective against mosquitoes, stable flies, lice, or ticks. The insecticides recommended against these insects are synergized pyrethrins, rotenone, and the organic thiocyanates.

The face fly is a recently introduced pest from Europe and is of great concern to livestock growers in several states. This pest congregates around the eyes, nostrils, and mouth of cattle and to a lesser extent on horses, sheep, hogs, and dogs. Its tenacious clustering about the eyes disturbs animals and causes them to fight the flies, thus interfering with proper feeding. The most serious threat of the fly is as a possible carrier of eye worms, pink eye, and other eye diseases. This species is an intermediate host of *Thelazia rhodesii* Desmarets (an eye worm) in Russia and could probably transmit similar parasites in the United States and Canada. The fly has spread southward into Virginia and Maryland and into western Iowa. There is no reason to believe that the fly will stop until it covers most of the United States.

Research by several states and personnel of the USDA Entomology Research Division has indicated that conventional sprays are of little use in controlling the face fly. Even thorough spraying of the face does not provide very good results. Experimentation with smears containing Dipterex,* DDVP, malathion, and dimethoate to the face has provided results that look promising. The drawback to these preparations is the necessity for almost daily application. A 0.2 per cent DDVP smear mixture has been registered and some of the

(Continued on Page 84)

*Dimethyl 2,2,2-trichloro-1-hydroxyethylphosphonate

Arizona Fertilizer & Chemical Co.

Arizona Firm's Growth Coincides With State's Agricultural Progress

During the past 30 years, farming has developed into Arizona's largest industry. A company that has both contributed to this development and benefitted from it looks forward to continued growth. When founded in 1930, Arizona Fertilizer and Chemical Company, Phoenix, was the state's first fertilizer business and, in 1939, the company erected the state's first insecticide plant. Instead of the original horse and wagon, Arizona Fertilizer and Chemical Co.'s equipment today consists of plants in Phoenix, Yuma, Toltec, and Willcox, plus five subsidiary companies.

IN the 25-year period from 1930 to 1955, the value of Arizona's farm crops increased from $46 million to a whopping $380 million while the number of irrigated acres merely doubled, and the state now is among the nation's leading farm states for many crops.

Although the increase in available farm land and the low value of 1930 dollars must be taken into account when considering these figures, it is no coincidence that the state's first fertilizer business was founded in 1930 when the rise in output began. The firm's original equipment consisted of a horse and wagon and its stock in trade came from various barnyards. Aptly enough, the venture was named Arizona Natural Products Co. The company twice has changed its name to keep up with its expanding operations and its appearance today bears little resemblance to the original firm. For most of the past 30 years the firm was known as Arizona Fertilizers, Inc., and its present name, Arizona Fertilizer and Chemical Co., reflects its increasing activity in the manufacture and sale of a wide variety of pesticides, defoliants, and industrial chemical specialties, in addition to fertilizers.

Frank M. Feffer, the president of the company, joined Arizona Fertilizers in 1935, a year after it had been purchased by his father,

J. A. Feffer. Prior to joining the company, he had been an insurance agent in Illinois. In 1937, M. F. Wharton Sr., an associate professor of horticulture at the University of Arizona, joined Frank Feffer in the company. Two years later, the firm's first insecticide dust blending plant, also the state's first, was built. The company no longer enjoys its position as sole fertilizer and insecticide producer for Arizona, of course, but it can look back on a number of important "firsts" in its type of business. They were, for example, the first in Arizona to label contents of bags of fertilizer; the first to provide balanced fertilizer; the first to manufacture technical concentrates; the first to require college degrees for all field men; the first to provide laboratory service; and the first to put such minor elements as zinc, manganese, and iron in fertilizer.

Insistence on technical know-how always has been a policy of Arizona Fertilizer and Chemical Co. The firm's field men are encouraged to make it a point to keep abreast of the latest developments in agricultural chemical research. A modern laboratory, staffed with two entomologists, an agronomist, a plant physiologist, and a plant pathologist, always is at the disposal of the field men for research or for the solving of special problems.

Instead of one horse and wagon, Arizona Fertilizer and Chemical Co.'s equipment today consists of manufacturing plants in Phoenix, Yuma, Toltec, and Willcox, plus five subsidiary companies and an array of modern machinery, vehicles, office buildings, and laboratories.

The Toltec plant was Arizona's first completely integrated plant for processing basic insecticidal chemicals and blending finished dusts. Opened in the summer of 1952, the plant is equipped with twelve-ton-per-hour insecticide dust blending machinery and complete facilities for making emulsifiable powders. An addition, opened in June 1953, houses a micro-pulverizer unit.

Two of the firm's subsidiaries are in California, one at Blythe and the other at El Centro. Both are named Arical Company. Arical is managed by Don Keyfauver, its president, and Hugh M. Helm, secretary-treasurer. The original company was started following World War II when Mr. Keyfauver opened a dealership in the Palo Verde Valley, of which Blythe is the center, and operated as a dealer for products of Arizona Fertilizer and Chemical Co. In the early 1950's Arical Co. was incorporated by Mr. Keyfauver, in connection with Mr. Helm and Arizona Fertilizer, and has grown to be the largest fertilizer and chemical company in the Palo Verde Valley, equipped not only with a liquid and dry insecticide plant, but with a dry fertilizer mixing plant as well. Arical handles all forms of agricultural chemicals.

In December of last year, Arizona Fertilizer and Chemical Co. purchased all of the assets of the Arical Co., but maintained it as a separate company, a division of Arizona Fertilizer. At that time, Mr. Keyfauver moved to the Imperial Valley and opened a warehouse in El Centro, where he now is engaged in developing a sales organization similar to the one he had built at Blythe.

Another subsidiary, Farm Chemicals Company of Phoenix, is a liquid fertilizer company that also produces and markets liquid defoliants and liquid soil conditioners. It operates strictly as a manufacturing organization and has no sales personnel and, consequently, no management personnel other than the people in Arizona Fertilizer and Chemical Co.

Plant Protection Co., Phoenix, a fourth subsidiary, primarily is a seed treating company and also functions only as a manufacturer, with no sales personnel.

The fifth subsidiary company, Cortez Chemicals Co., Phoenix, is an industrial chemical company, under the management of Seymour Thomas, who joined Arizona Fertilizer and Chemical Co. early this year after having spent a number of years as a research and development man and as an area manager for another industrial chemical company. The three lines of endeavor in which Cortez at this time primarily is interested are: the making of agricultural specialties, such as emulsifiers, and spreader-

M. F. Wharton, Sr. (left) and Frank Feffer (second from left) are shown on an inspection tour of the liquid insecticides section of the firm's Toltec processing plant. The two men are credited with having been prime movers in the progress of Arizona Fertilizer and Chemical Co. Others in the picture are: M. F. Wharton, Jr. (second from right), production manager, and Dick Leigh, manager of the Toltec plant. This photo was taken just prior to the opening of the plant in 1953.

Crop Comments, a publication issued monthly by Arizona Fertilizer and Chemical Co., contains comprehensive articles on topics of interest to Arizona farmers. A highlight of each issue is a cartoon which describes the featured article in a humorous yet informative style. Crop Comments never is used as an advertising medium.

stickers; hard-surface cleaners used primarily in industrial cleaning; and high purity acids.

Long a president of the company, Frank M. Feffer has been joined in the firm's operation by his son, Frank M. Feffer Jr., as secretary-treasurer. The younger Feffer is the third generation of the family to take an active part in the company. Frank Sr., with the aid of Mr. Wharton, must take the major portion of the credit for the company's present standing and past accomplishments. Since he joined the company in 1935, he has been a prime mover in the company's progress.

Mr. Wharton, who retired earlier this year because of ill health, had been assistant horticulturist of the faculty of the College of Agriculture of the University of Arizona before joining Arizona Fertilizer in June 1937. In 1934 he was assigned to study the cultural practices, particularly plant fertilizing, for the growing agricultural industry in the Salt River and Yuma areas. In this position, he revolutionized application methods and plant feeding in these areas and introduced practically every grade of fertilizer now used by Arizona farmers in the growing of such crops as lettuce, carrots, melons, small grains, and cotton. Mr. Wharton currently maintains his association with the company as a director, despite his retirement.

An indirect, but important, contribution to Arizona's agricultural progress is a monthly publication, *Crop Comments*, issued by Arizona Fertilizer and Chemical Co. Prepared in manual-page form, this junior-size newspaper features comprehensive articles on such topics as onion production, cole crops, soil reclamation, and management and production of grain sorghums.

In addition, any issue could contain some interesting writing on cotton culture, alfalfa seed production, vegetables, winter grains, fumigation of potato land for nematode control, how to deal with salt accumulation, or almost any other subject pertaining to up-to-date farming operations. A highlight of each issue is a cartoon by Bud Warner, staff artist, which describes the featured article in a sharply humorous style.

Crop Comments, which is mailed to more than 4,000 Arizona farmers every month, is informative and educational and never is used as an advertising medium.

A typical member of the laboratory staff employed by the company to assist growers with any problems that might arise is Stuart Evans, a plant pathologist. A native of Virginia, Mr. Evans was brought up on an apple farm in New Jersey where his father, also a plant disease specialist, carried out many experiments. He received his B.S. degree in biological sciences from Arizona State College at Tempe, and his master's degree in plant pathology from Oklahoma A. and M.

Mr. Evans often works directly with the farmer, or he may deal only with one of the company's many field men, who serves as a go-between with the crop grower.

Looking to the future, Frank Feffer Jr. believes that Arizona Fertilizer and Chemical Co. will continue growing through expansion. "We are vitally interested," he said, "in expanding our operation both agriculturally and industrially."

"We feel that Arizona Fertilizer and Chemical Co.," he continued, "and companies like ours, who have founded their business on the same basic principles of service and quality of products, are in as strong a position as ever. We don't believe that local companies who do a good job of working with the farmers and customers in their areas have to worry about future competition, as long as they also do a sound job of running their businesses."★★

Continuing programs of study and research are carried on by Arizona Fertilizer and Chemical field men and research personnel. Shown here is a typical meeting of field men and other specialists with executives of the firm. Such meetings are held each Saturday morning at the Phoenix plant.

Association Of British Manufacturers Acts As Control In Absence Of Legislation

The policies of the Association of British Manufacturers of Agricultural Chemicals are positive and constructive, for the industry is well aware that its own prosperity is inseparable from that of its customers. Increased output from the land not only is a noble aim: it is good business.

by G. Huckle
Chairman — ABMAC

IN Britain, chemical crop protection on the farm is a relatively recent innovation. Not very long ago, British agriculture was practised on strictly traditional lines, with little aid from chemicals other than fertilizers. Many farmers can remember the time when weeds, pests and diseases in farm crops had to be fought almost entirely by cultivation and crop rotation.

Most of the products in use in England today for protecting agricultural and horticultural crops can fairly be described as "artificial chemicals," for they are manufactured from basic raw materials, such as coal and petroleum by processes that have no counter-part in nature. For many years chemical fertilizers—"artificials" — had been regarded as somewhat suspect by the less progressive members of the British farming community. But within a generation, the farmer's attitude toward chemicals has undergone a radical change. Modern farmers, in Britain as elsewhere, have accepted chemical pesticides with remarkable alacrity, and use them, as they use chemical plant foods, as an integral part of crop production.

The recent rapid growth of chemical crop protection in Great Britain has not occurred by chance. Ever since 1940, when the war situation made it vitally necessary to increase farm productivity, British farmers have continued to seek new methods of improving the output and quality of their crops. This same period has coincided with tremendous advances in chemical technology, most notably in the development of large-scale methods of carrying out complex organic syntheses. The discovery of DDT and BHC, 2,4-D and MCPA triggered off a systematic search for other man-made chemicals with useful pesticidal properties. Thus there emerged a new and vigorous sector of the British chemical industry wholly devoted to the development and manufacture of agricultural chemicals.

Despite the fact that in Britain most of the exciting progress in the science and practice of chemical crop protection has occurred only in the past 20 years—indeed ABMAC, the Association of British Manufacturers of Agricultural Chemicals has been known by that name only since 1958—the industry has a long history extending back into the mid-nineteenth century. A significant part of its present strength must lie in the wealth and experience of the founder firms, many of whom are still flourishing today.

ABIM — the Association of British Insecticide Manufacturers—the forerunner of ABMAC, was formed in 1926 by eight members of the London Chamber of Horticulture when that organization failed from lack of funds. Initially, as the Association's origin implies, the use of chemical sprays and dusts was confined mainly to hops and fruit, both high-value-per-acre crops. ABIM's first chairman was W. F. Stiff of Cooper McDougall and Robertson Ltd. The first secretary was H. J. Jones of Hemingway and Company, one of the oldest manufacturers of insecticides in Britain. Mr. Jones still serves ABMAC as honorary vice-chairman, though he retired from Hemingway's four years ago.

ABMAC, like ABIM, is not a trading organization. It neither fixes prices nor sponsors commercial agreements between its members. Its policies are positive and constructive, for the industry is well aware that its own prosperity is inseparable from that of its customers. Increased output from the land is not only a noble aim: it is good business. This is why the Association's thirty-two members, representing 95% of Britain's agricultural chemical industry, spend about £1 million a year on research to further the control of pests, diseases and weeds.

The marked absence of legislative control over the quality of British agricultural chemical products must appear strange to overseas observers. Excellent standards are maintained by a system of voluntary co-operation admirably suited to the peculiar needs of this very diverse and rapidly expanding industry. This unusual way of work-

(*Continued on Page* 82)

Point-Of-Sale Merchandising Key to Eveready Sales Program

The home garden market—$150 million at the manufacturer's level—has developed into an increasingly attractive branch of the agricultural chemicals industry—and still is growing.

Union Carbide Consumer Products Company, which offers a home garden line of some 14 products, analyzes the market and the home garden buyer, observing that selling to this market involves principles quite different from those involved in selling basic agricultural chemicals.

Carbide emphasizes product identification and descriptive labeling, rather than attempting to turn the home gardener into an expert in entomology or chemistry.

The Carbide approach is to provide an effective multi-purpose product, and emphasize simplicity of use and effective results in advertising to the consumer. They endorse the idea of product selection on the basis of a reliable brand name rather than trying to select a specific chemical ingredient.

A RAPIDLY expanding market for agricultural chemicals, which many firms in the field have been eyeing and considering with increasing interest, is the manufacture of home garden products and specialties. The market, as we think of it today, is quite new, and can't compare with the home garden industry of 20 years ago. Today's market has materialized largely because of the move to "suburbia," – and the heightened interest of the average householder in a well cared for lawn and a productive vegetable, fruit and/or flower garden. The end user which this branch of the industry caters to is, of course, the home owner, – not the farmer.

The home garden market for pesticides and fertilizers not only is new, it is also completely different from the vastly larger farm market. The buyer normally is poorly-informed about the nature and approved method of use of the products he buys. He has had no experience with the new materials he is encouraged to use,—nor even with such old standards as lead arsenate and Paris green insecticides, or even agricultural lime. Candidly speaking, he's a "city feller," who is used to getting milk from a bottle, and does not realize that plants (such as lawns, flowers and vegetables) need food and protection against insect damage and disease. Furthermore, he does not, like most farmers, have ready access to up-to-the-minute advice from his county agent or ag experiment station.

At the same time, the home gardener is a relatively intelligent individual, who, although not informed about agricultural chemicals and their use, is anxious to learn. He is careful about reading labels and literature,—and tries to follow instructions. Price is not normally his sole criterion in purchasing, and he often exhibits the characteristics of a hobbyist or "garden bug." He is likely to buy any product or series of products he hopes will help him achieve "green thumb" results . . . and he is anxious to believe that those miraculous results pictured in the seed catalogs really can be achieved.

But there is another reason for the boom in the garden market,—the development of new and more effective pesticides,—and the manufacture of more concentrated and improved plant foods. In the early 1900's, there were just two or three insecticides, a couple of fungicides, and one or two herbicides available. As recently as World War II, insecticides in general use by the home gardener consisted primarily of the botanicals, pyrethrum and rotenone, lead arsenate and Paris green; the fungicides, Bordeaux mixture and lime sulfur; and herbicides such as borax and sodium arsenite.

Today, we have about 236 commercial chemicals used as pesticides in over 7,000 branded formulations. And, even though not all of these are used in home garden pesticides, there still are a substantial number of different basic pesticides which are so employed. Figures cited recently by Dr. H. Haynes* indicate that of the 67 commercial fungicides, 21% are used in home garden formulations. Similarly 32% of the 84 herbicides are so used.

*Garden Pesticides by Dr. Harry L. Haynes, technical manager, Biological Products, Union Carbide Consumer Products Company, at the May, 1960 convention of the Chemical Specialties Manufacturers' Association, Chicago.

36% of the 66 insecticides,
25% of the 8 soil fumigants, and
30% of the 11 rodenticides.

According to Dr. Haynes, "Only within the past ten years, has it been possible to finally provide the (home garden) consumer with a reasonably rounded line of pesticides to satisfy his needs." Thus, the development of new and effective pesticides, together with the actual birth of the home gardener have contributed to growth of the home garden market,—a very attractive new outlet for agricultural chemicals.

Union Carbide Corporation, New York, was among the basic chemical producers who recognized signs of the growing home garden market in the early stages. Its new product planning division and market research and sales promotion departments began ten years ago to study this new industry,—its potential, characteristics of the ultimate consumer, retail outlets, sales appeal factors, etc. Based on these studies, Carbide has developed some new ideas on how home garden pesticides should be sold. Emphasis, they believe, should be on product identification and descriptive labeling.

R. C. Purcell, of Carbide's advertising and sales promotion department, points out that sales of agricultural chemicals for the "small package market" used to be specific, through "specialty stores." Now, they are much more widely available through multiple retail outlets; including drug stores, variety stores, super markets, and hardware stores. Carbide has promoted the idea of multipurpose products for the home gardener. It is not necessary, say Carbide's market specialists, to confuse the consumer by telling him he needs sixteen different chemicals to control his insects, diseases, and weeds. It is rather optimistic, they point out, to think that the average gardener can, or is willing to, select the effective pest control agent for his specific problem from sixteen different chemicals. Promotion of a multipurpose spray, dust or other formulation by stating its function in the name, – such as fruit tree spray, rose dust, or lawn weed killer, is much more readily understood and appreciated by the buyer. The home gardener is not a chemist, – and cannot absorb chemical or entomological training on a label. The Carbide approach is based on simplicity, providing an effective multipurpose product, emphasizing simplicity of use and effective results in advertising to the consumer, and developing the idea of product selection on the basis of a reliable brand name rather than a specific chemical ingredient.

Merchandising at the point of sale is the key to the sales success of Eveready garden products. Typical of Union Carbide's store fixtures available without cost to retailers is this unit in use at B & B Hardware, Woodmere, L. I. Carbide's multipurpose products appeal to a wide cross section of home gardeners who may be unfamiliar with specific chemicals and pests.

A. H. Goff of Carbide's Garden Product Sales department relates that the corporation's formal entry into the home garden market was in 1957, when it introduced its line of "Eveready" home garden products. At that time, most "small package" items were handled by hardware stores—a natural outlet, – since they also handled garden products and tools, such as rakes, grass seeds, and lawn mowers. Carbide already was "old friends" with the hardware industry (through its sales of the "Eveready" battery),—and naturally introduced its garden line through the hardware store outlets. Sales today, however, are through all retail outlets,—including suburban garden centers, drug stores, super markets, and variety stores.

Distribution of home garden products follows the distribution pattern of most consumer products. The manufacturer sells to wholesaler, who, in turn, sell to the respective retail outlets. There is some indication that super-markets have been the fastest growing retail outlet for home garden products in the past two years, – but this varies with the general geographic area. In sections of the country, such as the west coast and Florida, where "outdoor living" is not as short-lived as in the colder sections of the country, complete garden centers are prominent in the home garden sales picture.

(Continued on Page 81)

Bagpak Division Laboratory

Research And Development In Multiwall Bag Construction

Not too long ago, all agricultural chemicals were shipped either in one or two types of multiwall bags or in drums or other types of rigid containers. Recent years, however, have seen the development of so many improved and complex fertilizers and pesticides that there no longer is a so-called standard bag or container that can do a universal job. Packaging design research helps the manufacturer select the right package for each of his products.

by William L. Shoemaker
Product Manager, Bagpak Division
International Paper Company

RESEARCH and development are magic words in this atomic and space age—even in packaging agricultural chemicals.

Not only does the search for new ways to do things play a mighty role in the precise sciences, but the quest for new knowledge is also having a widespread impact on the agricultural chemicals industry.

Time was, and not so long ago, when most of these chemicals were shipped in one or two types of multiwall bags, drums or other rigid containers.

But in recent years, so many new and improved fertilizers and pesticides have been developed and sent to market, that today it is virtually impossible to find so-called "standard" bags or containers to do a universal job.

So how does a manufacturer, processor or user of agricultural chemicals decide on the right package for a specific product?

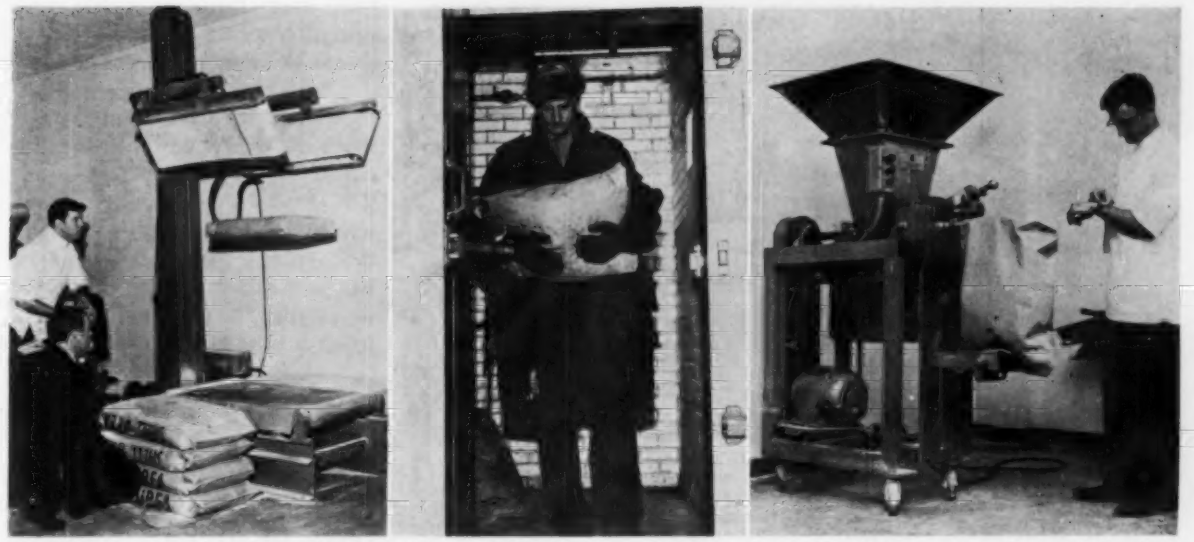
Packaging design — coupled with research and development on new packaging materials and techniques being carried out by such companies as International Paper, for instance—can provide a big part of the answer.

As a step in this direction, I-P's Bagpak Division last spring placed in operation a new Research Center at Camden, Arkansas. Along with the packaging problems of the agricultural chemical industry, this ultra-modern laboratory was designed specifically and equipped to aid users of multiwall bags.

Staffed with trained technicians and experts, this facility is at the disposal of I-P's customers and potential customers. To solve a multiwall packaging problem, Bagpak's Camden staff generally starts with the consideration of five points:

1. Will multiwall bags do the job—and, if so, what type of bag will do it best?
2. What type of multiwall bag is best suited for efficient filling geared to manufacturing output, economics

This modern, air-conditioned building at Camden, Arkansas, houses Bagpak's new research center where packaging design — together with research and development on new packaging materials and techniques — are being carried out.



Typical tests conducted at the laboratory include: (left) the "drop test" which simulates conditions equal to dropping a multiwall sack about 30 feet; (center) the "Arctic-jungle room," where temperatures can be varied from five below zero to as high as 130° above; and (on the right) the time machine which gives an accurate prediction of how long it will take to fill a multiwall bag on a new automatic valve-packing machine.

and demand? In short, will it fit into an overall packaging system?

3. Will special treated or coated papers be required to protect adequately the product in storage?
4. What type of bag construction and bag closure are best able to stand up in shipping to the ultimate user?
5. Does the bag measure up to the overall yardstick of economics and advertising value?

All forward looking multiwall bag manufacturers are well aware of the importance of research and development. Many, like the Bagpak Division, have invested huge sums of money in the past few years for new laboratory facilities and competent technicians.

"Necessity is the mother of invention." When packaging problems arise, they are usually solved by forward thinking. A good many years ago and soon after the multiwall industry started to make bags for packaging fertilizer, it was determined that it would be desirable and necessary to place a "moisture vapor proof" ply in the bags.

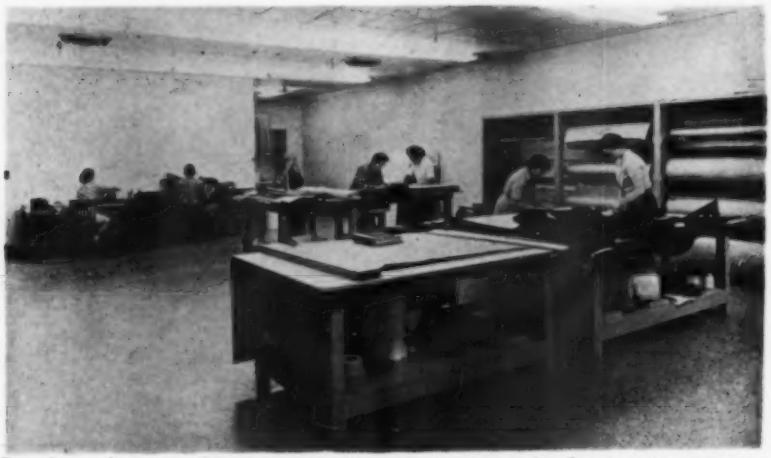
International Paper, through its subsidiary at that time, Bagpak, Inc., went to work on the problem and developed and promoted a multiwall grade of asphalt laminated paper.

Asphalt laminated paper, as used in multiwall bags, is very special. It has to be flexible and remain strong at low temperatures, must not bleed under a reasonably high product packaging temperature, and must possess good moisture vapor protective properties. These properties, and others, have been built into asphalt laminated paper over the years. Asphalt laminated paper today is by far the most widely used protective paper in bags.

Over the years, sewn open mouth and sewn valve type bags—made with at least one ply of asphalt laminated paper as a moisture barrier—were used to package everything from ammonium nitrate to low-analysis fertilizers such as 5-10-5. But in time it became obvious that the more critical and expensive ammonium nitrate required more protection than 5-10-5.

Thus, thanks to research and development, polyethylene coated paper has been developed by the multiwall industry to take the place of some asphalt laminated in packaging more critical and expensive agricultural chemicals. True, P E (polyethylene) is more expensive in initial cost but it offers greater moisture vapor protection and other benefits than A L (Asphalt Laminated)—depending upon the coating thickness—and

Robert L. Reeves (left), technical director of the Bagpak Division's research center, discusses procedures with T. A. McCord, Bagpak's sales-service department manager, and H. R. Magness, southern regional sales representative.



Sample makers in this room create hand-made multiwall bags for every use. Bagpak's people work closely with customers to develop just the right design which, after thorough testing, will be mass-produced.

where it is required, it assures more satisfied customers, less complaints, and, generally, a better way of doing business which can mean money saved to all concerned.

Only by utilizing research and development facilities, however, can a manufacturer be sure of just the right bag.

In addition to the development work of multiwall bagmakers, manufacturers of the paper which goes into the bags have been conducting large-scale research programs pointed at producing new and improved kraft papers for multiwall bag end-use. The recent and important development of extensible kraft papers is the result of this work, and bag-makers now are applying the paper to bring new efficiency to many users of multiwalls.

Also in the realm of papermaking and paper converting operations, new and improved, special coated or treated kraft papers have been developed to provide all types of product protection, such as moisture vapor proofness, grease proofness, water repellency and many others.

All these innovations and improvements have a single purpose —to provide better, less expensive and/or more efficient packaging for a wide variety of products, including those of the agricultural chemical industry. It means, among other things, that many chemicals now may be safely, economically and efficiently shipped in multiwall bags when formerly it was considered necessary to ship them in drums or other rigid containers.

This vibration table simulates the motion experienced in trains and trucks which carry loaded multiwall bags. Bags that pass this test are sift-proof, thus assuring satisfactory delivery of the customers' products.

So far as bag design, itself, is concerned, there has been a marked recent movement toward using the pasted valve stepped-end type. The present trend in shipping is to unit loads – or "palletizing" – and the squared pasted bottom type bag is somewhat more adaptable to a pallet than the sewn type. A pallet load of fertilizer or pesticide packed in stepped-end bags presents a square, neat appearance,—with the analysis and brand name —as well as customer advertising—easily read on the butts of the bags.

However, the stepped-end bag cannot be considered "standard" —so far as packaging design is concerned – since other factors than palletizing and shipping must be considered. These may determine the type of bag which should be used in a given instance to package and ship a given product.

And this is where the entire matter of package design and research and development enter the picture. Everyday, in countless applications, development work is paying off to makers of agricultural chemicals and other users of multiwall shipping bags.

One other important point should be remembered: For greatest efficiency in packaging any free-flowing commodity, specific packaging machinery should be used. International Paper throught its affiliate company – Consolidated Packaging Machinery Corporation of Buffalo, New York—constantly is engaged in research in this direction, as are other companies in the agricultural chemicals industry.

By skillful utilization of the research and development facilities available, more and more companies in the agricultural chemicals industry are finding that multiwall bags are now better than ever—and that the future offers even greater improvements.

The facilities and know-how are available. It only remains for progressive companies to use them.★★

10th Annual Meeting

Fertilizer Industry Round Table

THE tenth annual meeting of the Fertilizer Industry Round Table scheduled for November 2, 3, 4 at the Mayflower Hotel, Washington, D. C., will feature a series of discussions on fertilizer production techniques and fertilizer production problems.

Raw material specifications, preparation and analysis will be reviewed at the 1960 meeting. Such questions as availability, grade and usage of phosphate rock;—sources, characteristics, storage of phosphoric acid; and triple superphosphate problems will be among the topics studied. The section on raw materials will be followed by one dealing with standardization of raw materials, with reports and comments from both fertilizer producers and fertilizer raw material suppliers. The concluding session will deal with preneutralization, a subject discussed at the 1959 meeting,—including a report on developments during the past year.

Members of the executive committee; Joseph Reynolds, Jr., H. L. Marshall, and Albert Spillman, will preside at various sessions of the meeting. Vincent Sauchelli, chairman of the Round Table, will not be present at the 1960 meeting, since he is on an extended tour of eastern countries.

1960 PROGRAM

Wednesday, November 2

10:00 A.M.

PHOSPHATES

Phosphate Rock—Availability, Grade & Usage
Phosphoric Acid—Types, Sources, Characteristics, Usage Storage & Handling
Triple Superphosphate Problems
Ammonium Phosphates
Economics

Thursday, November 3

9:00 A.M.

STANDARDIZATION OF RAW MATERIALS

Why Uniformity?
Users' Panel
Raw Material Producers' Panel

COMMUNICATION PROBLEMS IN INSTRUMENTATION (Panel)

Case Histories
New Developments
Automatic Sampling

Friday, November 4

9:30 A.M.

Business Meeting

10:00 A.M.

PRENEUTRALIZATION (Panel)

EXECUTIVE COMMITTEE OF FERTILIZER INDUSTRY ROUND TABLE

(Left to right) A. Spillman, Fertilizer Manufacturing Cooperative; James Reynolds, Jr., Davison Chemical Co.; chairman, Vincent Sauchelli; and secretary-treasurer, H. L. Marshall, Olin-Mathieson Chemical Corp.

OLDBURY® SODIUM CHLORATE

When chemicals are used, Oldbury sodium chlorate is *still* the most dependable way to *destroy* weeds.

It kills them all.

It's the most inexpensive way, too. For a mere 25¢, you can sterilize 100 square feet of drainage ditch, fence line or roadway for *at least* a year.

Open-head drum empties faster. Oldbury sodium chlorate comes in a fast-opening drum. A single lever seals and reseals the drum with a metal band. Full open head makes pouring, scooping, or shoveling easy.

Available in 50-, 100- and 450-lb. sizes.

Technical aid. Full-time Hooker agronomists can help with weed control plans and advise on handling, storing, and using sodium chlorate.

Write for descriptive bulletin on how these men can help you.

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611 BUFFALO AVENUE, NIAGARA FALLS, NEW YORK

HOOKER CHEMICALS PLASTICS

Sales offices: Buffalo, Chicago, Detroit, Los Angeles, New York, Niagara Falls, Philadelphia, Tacoma, Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B.C.

Pesticide Registration Laws Of Central and South America

Increased interest in export of pesticides prompts this review of pesticide laws for Central and South America.

Several South American companies have no particular laws concerning pesticides, — others require sizeable samples for testing and fees to cover expenses involved.

Most countries require or expect labels in Spanish, with basic label requirements similar to those in the United States.

by Eugene J. Gerberg
Director
Insect Control & Research, Inc.
Baltimore, Md.

THIS article is not intended as a legal discourse on the subject of pesticide laws in general. It is primarily a report on the laws of the area indicated, and the requirements they establish. For those people engaged in the export of pesticides, it is extremely important that they be aware of existing laws and the ever increasing regulations.

I believe the United States set the pattern, with the Insecticide Act of 1910 and the Federal Insecticide, Fungicide and Rodenticide Act of 1947. The various Latin American governments have promulgated pesticide laws, to protect the public or the farmer, or to protect home industries. Of the 20 independent countries in Central and South America, 5 have existing or pending laws. Five countries, Chile, Cuba, Haiti, Honduras and Panama, apparently do not have any pesticide laws, as information on these countries was unobtainable.

Most countries require or expect labels in Spanish or, in the case of Brazil, in Portuguese. The basic label requirements are quite similar to requirements in the United States—an ingredient statement, instructions for use, precautions, antidotes, manufacturer's name and address, and net weight or volume. Some countries require the word "POISON" in black or red letters, and the poison symbol —the skull and crossed bones. A few countries charge for registration. These charges may vary from a few cents to $150 per label. Each country has its own peculiarities. Usually a basic law is passed and then numerous amendments, decrees, etc., are then added to supplement the original law.

Dr. Gerberg, a consulting entomologist, has traveled extensively throughout Latin America for various chemical companies and Latin American governments. His work has been concerned with the use, application, and sale of agricultural chemicals, and preservation of stored products.

In 1944 ARGENTINA passed a law prohibiting the sale of insecticides, fungicides, herbicides and their adjuvants, without prior authorization by the Ministry of Agriculture. An Inspection Board was created to supervise this law. Registration is required and is accomplished by submitting data on the product, accompanied by samples. Tests are conducted to verify the submitted data. The label must be in Spanish, and must contain an ingredient statement, the date of production if the product is unstable, instructions for use, dosage, and, if poisonous, the word "VENENO" (or poison) in red letters plus the symbolic skull and crossed bones, precautions and antidote. If any change is made in the original components of the product, the registration is cancelled and the process must start all over from the beginning. Argentina has also added a new twist with a decree of May, 1951, which requires previous authorization of the Ministry of Agriculture for all publications or commercial advertisements, both oral and written, which advise or recommend the preventive or curative use of products on crops in reference to agricultural pests, or means and forms of application of these products. Technical and scientific articles are excluded from the terms of this decree.

BOLIVIA has a decree of January, 1943, which requires that, in addition to other information, the weight or volume expressed in the decimal system must be shown. The price per unit in bolivanos must be marked on the package. The registration number of the Ministry must also be indicated. The law does not say that the label must be in Spanish – but it is implied.

BRAZIL requires registration or a license from the Ministry of Agriculture before any pesticide can be sold. Samples and analyses must be submitted and label requirements must be met. The registration is valid for five years and must then be renewed. Any change in the composition necessitates a new registration. A provisional permit may be issued under certain circumstances. The label requirements are the normal requisites, plus any poison symbol, that may be required by the Department of Public Health. No exaggerated or untrue statements pertaining to the efficiency of the product will be allowed. Though the law doesn't actually say the label has to be in Portuguese, it is doubtful that registration could be obtained if this point is neglected.

CHILE has no law regarding insecticides.

COLOMBIA has a resolution dated 2 October 1953 regarding the use of 2,4-D and requirements for the importation and sales of this herbicide. Importers and sellers of 2,4-D must obtain a license from the Ministry of Agriculture and submit a monthly report on their sales. The decree of 22 March 1957 requires that the importer or manufacturer register his products. The label must be in Spanish and must include ingredient statement, uses, dosage, precautions, and antidotes. In addition, a certificate visaed by a Columbian Consul is required for an imported product, stating that it is freely sold in the country of origin. The registration is for an indefinite period, but can be cancelled.

The COSTA RICAN decree was issued in September, 1954. Registration must be made on official paper costing one colon (about 14¢) and the manufacturer must supply a considerable amount of information on the product, plus a sample. The label must be in Spanish and must include the name or trademark, a complete ingredient statement with percentages, the net weight or volume in the metric system, caution and antidote statement, poison label and symbol if applicable, use statement, manufacturer's name and registration number. The Costa Rican law is a rather reasonable law, simple and clearly written. It does not place an undue burden on the manufacturer as to cost of registration, thus allowing a competitive market to exist.

The DOMINICAN REPUBLIC does not have a law requiring registration, but requires the importer of pesticides to obtain an exoneration.

ECUADOR has a law of April, 1953, and a decree of November, 1956. These measures do not require registration, but specify that prior permission is necessary to import pesticides and application equipment duty-free. The sale of these products in the country is also regulated.

EL SALVADOR passed a decree December, 1957, requiring a certificate of approval which must be obtained from the Ministry of Agriculture and Livestock. Application must be in writing and must be accompanied by a large-sized sample, (at no cost). A complete label in Spanish is required. Technical data on the product must be included. A certificate of origin, plus proof of use in the country of origin, is required. Providing that the samples test out properly, and the documents are satisfactory, a certificate can then be issued. Field testing may be eliminated if the product is in use and well known. Re-registration of the product is required if the formula is in any way modified. If the product does not conform to its specifications, it is considered adulterated. If household pesticides also have agricultural uses, then they must meet the requirements of this decree. Under certain conditions pesticides may be imported prior to complete registration, but the use of these products will be under the control of the Ministry of Agriculture. Pesticides may be sold only by authorized persons or firms who are responsible for the quality of the products.

GUATEMALA has a decree issued May, 1957, which requires that the importation of pesticides be under the control of the Director General of Agriculture, Division of Plant Sanitation. Necessary regulations will be issued concerning the entry of pesticides into the country. Withdrawal from Customs of imported pesticides will not be allowed without proper authorization. The Division of Plant Sanitation may demand literature, tech-

To avoid the many legal pitfalls of pesticide exportation, it is important to become acquainted with the pesticide laws of the countries involved.

nical information or may require testing of products to be used in agriculture. Any charges incurred will be for the account of the interested party.

HAITI does not have a pesticide law, nor does HONDURAS.

MEXICO passed a law in August, 1947, which regulates the inspection, certification and sale of pesticides. Household insecticides that can also be used for agriculture must conform to the law. A written request for registration accompanied by two samples of the product (to be supplied gratis), plus three samples of the complete label in Spanish must be submitted. The registration number must be added to the label upon approval. The applicant must also submit the name and address of the representative and distributor, and the warehouse where the product will be stored and all technical data, etc. If the applicant is not the manufacturer, he must submit a letter from the manufacturer stating that he is authorized to apply for this registration. If the laboratory analysis and field tests prove satisfactory, then a certificate of registration will be issued. If there is any change in the original specifications, the registration is immediately cancelled, and the process starts over. If the product is well known in the country, field testing may be eliminated. All commercial establishments desiring to sell these products must apply for an authorization from the Director-General. This application is somewhat long and has twenty-three items to be completed, including the registration number of the product to be imported, the use of the product, where or on what it is to be used, the price at which purchased, the price at which it is to be sold, etc. Advertisements and commercial bulletins must state only what has been found on tests and previous experiments as listed for the original certificate. All literature must contain the certificate number. Every two years the material must be submitted for reinspection.

NICARAGUA has a law of 1956 concerning the cultivation of cotton which includes a section on insecticides and fungicides. All persons or commercial entities importing commercial substances for the control of insects, pests and diseases of cotton must present to the Ministry of Agriculture a certificate of analysis for each pesticide introduced into the country. Local formulators must also present a certificate and must submit samples and data. There is a proposed law that will cover all pesticides imported or produced within the country which will require a label in Spanish, the date of manufacture, an ingredient statement, the date of expiration of the materials, precautions, and antidotes. Commercial establishments that sell these products must report to the Ministry the name and quantity of pesticides stored for more than 8 months and must not sell them without prior authorization from the Ministry, who may require sampling of the products to insure they come up to specifications.

PANAMA at present has no pesticide law, but there is an article under consideration by the National Assembly of the Republic of Panama which, if passed, would place the importation and regulation of pesticides under the Ministry of Agriculture, Business and Industry through the Department of Plant Sanitation.

PARAGUAY has a decree of July, 1941, which prohibits the introduction and sale of pesticides to be used on plants without prior permission from the "Defensa Agricola" of the Ministry of Agriculture and Livestock. To obtain this permission, an application must be submitted, accompanied by a sample of sufficient quantity for testing, an ingredient statement, methods of usage, and a certificate of analysis. All expenses for the testing of the product are for the account of the applicant. If the analyses and tests are satisfactory, then the product will be approved, permission to import will be granted, and the product listed in the registration book. A fee of 1,000 guaranis ($16.70) is required for each registration. This permission must be reviewed every three years. A product authorized for sale must have a label covering the required points and giving the registration number.

PERU has a decree of December, 1950, which requires previous authorization from the Director General of Agriculture in order to sell pesticides. All products must be registered and approved by the Ministry of Agriculture. Each application must be on official paper accompanied by 100 soles ($5.25) per label, plus a sample. The label must be in Spanish and have all the usual requirements, plus the registration number. No samples of the pesticide, or advertisement, may be distributed without previous permission of the Ministry of Agriculture. The registration is valid for three years.

URUGUAY has a law issued August, 1956, which states that pesticides cannot be sold without having been registered with the Ministry of Agriculture. The application for registration must be signed by an authorized agronomic engineer and must contain technical data on the product, samples of the label in Spanish containing the usual information, plus the name and address of the firm which registered the product, the registration number when issued, net weight or volume, plus the words "USO AGRICOLA" clearly indicated on the label. If the product is poisonous, the word "VENENO" and skull and crossed bones must also be on the label. There is a charge of 50 pesos ($5.00) for each application for registration. On Dec., 1956, an additional decree was issued primarily for the

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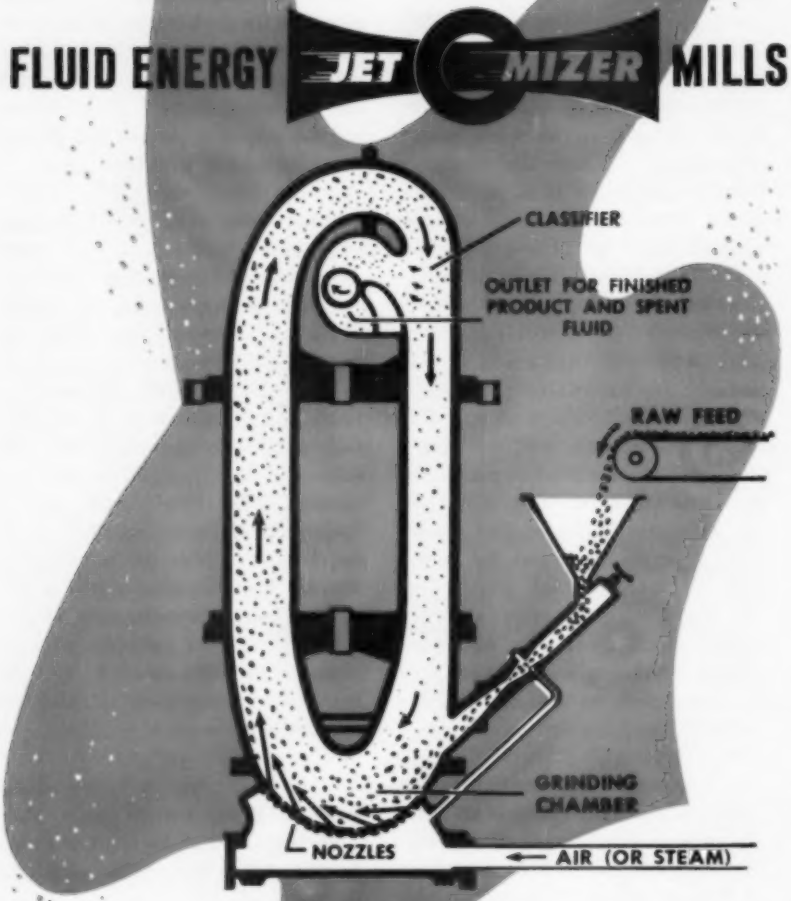

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protection of agriculturists who use phosphate type insecticides. This is primarily an educational program to make the agriculturist aware of the toxic nature of these pesticides.

VENEZUELA has passed a number of insecticide laws—1936, 1941, 1949, and the present decree of August 8, 1952. All establishments concerned with the production, distribution and sale of fertilizers, pesticides, animal foods, etc., are under the supervision of the Ministry of Agriculture and must conform to the present regulations. In order to make, import or to sell the above products, previous authorization must be obtained from the Ministry of Agriculture. Each product must be registered separately and the registration may be revoked if the product does not come up to specifications. In order to obtain the authorization, an application on official paper must be made accompanied by a payment of Bs 500 - Bs 1000 ($150 - $330). The applicant must present complete personal data as well as technical data. Three samples as well as three sample labels in Spanish must be presented. The labels must have the name of the product, trade mark, address of manufacturer and local representative, ingredient statement and percentages, net weight or volume, instructions for use, toxicity emblem if required, antidotes, and registration number. The various commercial enterprises must report to the Ministry the quantity of pesticides manufactured, imported, distributed, or sold during the months of January to July.

I have not discussed the fines or penalties that may be imposed for violations of these laws. From this brief discussion, it is rather evident that to avoid the many legal pitfalls of pesticide exportation one must become acquainted with the pesticide laws of the countries involved. Pesticide exporters should remember the Latin motto, "Caveat venditor" — let the seller beware.★★

AG CHEM

Fertilizer Views and News

by Vincent Sauchelli

Dr. Sauchelli is a Consultant to the Agricultural Chemicals Industry.

Facts and Fancies About Phosphates

YOU and I have listened to agronomists and soil scientists and even horticulturists, not to mention fertilizer salesmen, talk learnedly and quite convincingly to the effect that unless a phosphate or other plant nutrient is soluble in water, the plant could not utilize it. That's orthodox teaching. Can one deny it? Don't you believe it?

I say it is true as far as it goes; but there's more to this business of plant uptake of nutrients than the mere statement of its degree of solubility in water as a measure of its effectiveness in feeding agricultural crops.

True Water Solubility

Chemical compounds such as sodium or ammonium nitrate (which are water soluble,) will, when placed in the soil, split up into their component ions. In our example, the nitrate portion or anion remains in the soil solution and moves with the drainage water. Come a good, heavy rain, and much of the nitrate is carried off by the drainage water. Since it is completely soluble and there is nothing to hold it back, it may be carried to lower strata of the soil where it may be available to deep-foraging roots or it may return to the surface by capillary action during evaporation. Cases are well known in which tobacco and other crops on light sandy soils, for example, suffered severely from nitrogen starvation following drenching rains. The reason? The nitrate nitrogen being soluble and free in the soil solution in a large measure was leached out with the drainage water.

You see, if the only thing one can say of the property of a plant nutrient is that it is permanently water-soluble, that in itself is not necessarily a prized virtue. If one claims that a specific phosphatic material is completely water-soluble and, therefore, has superior virtues, one might, remembering the fate of the water-soluble nitrate, have reason to question the claim. In the case of phosphates, however, more is involved than water-solubility. There's the matter of "fixation" to consider. There's the more modern conception of electronic reactions to explain what goes on in the root zone when chemical fertilizers are introduced into it. Fortunate, it is for us all, that the water-soluble phosphate ion, the (PO_4) of the chemist, which is directly involved in plant feeding, becomes attracted to and held by the clay-humus complex of the soil and thus prevented from being leached out. Soils men explain many of these chemical soil phenomena by so-called "base-exchange capacity." Says Dr. W. A. Albrecht: (1) "The fallacious belief that fertilizers had to be water-soluble, and that they served the plant because they remained in solution in the soil, has been finally displaced. Those concepts were pushed out by our knowledge of the fact that soluble cations are absorbed on the soil's colloidal complex. Therefore, they are no longer water-soluble. After a day or two in the soil contact they cannot be washed out from there by water."

Is fixation of a phosphate then, a blessing or a curse? That depends on how you look at it. For my part, it would be quite disastrous if the phosphate ion were to remain in solution. Lucky for us, it becomes "fixed" by the colloidal complex; that is, absorbed on the surface of the clay and humus and then made available to the feeding rootlets by the process of exchange. Little, if any, of the phosphate is taken up by the plant root system as free ions swimming around in the soil solution. The fact of soil fixation of the soluble phosphatic ions is a real blessing to mankind, for phosphorus is one of our indispensable resources that is not renewable.

Let us, then not deplore nor decry the chemical reaction by which water-soluble phosphate ions in the soil become less soluble through fixation. The phosphate thereby is not lost through leaching. It does remain available in the root zone to feed the crop. The farmer who understands this, and in addition also appreciates the importance of liming and performs other soil management practices need not be too concerned about the warnings that some phosphates do not always remain water-soluble. All water-soluble phosphate ions behave in accordance with their chemical nature and can not remain soluble in the soil solution for any time worth talking about.

Sometimes persons whose job it is to explain chemical and phy-

(Continued on Page 81)

(1) Commercial Fertilizer, p. 37, June 1951.

AG CHEM

PRODUCTION ROUND TABLE

A Need for *Uniformity* in

EARLIER this year, (March, 1960), *Agricultural Chemicals* published an article in this column under the title "Uniformity in the Fertilizer Laboratory and Plant." Subsequently we conducted a survey of fertilizer manufacturers to find out how different companies conduct routine testing of raw materials and finished products, and how they report the results of such tests. The response to the survey was good, and findings are summarized on these pages.

An analysis of the survey emphasizes the need for some standardization of raw materials and uniformity in nomenclature to cover the complete description of processed raw materials. The survey also shows that:

1. The term "Moisture Value" (free or combined) has no real meaning unless further defined as to method of determination.
2. Free Acid is expressed in several ways, and determined by several methods by various manufacturers . . . thus this term cannot be used freely without further identification.
3. Particle size and particle size classification offer the greatest opportunity for variety. Of all questionnaires returned, no two listed the same set of screens for particle size classification. Only 15% of the group showed any agreement, in that screens 6-8-10-20 (presumably Tyler Standard) were included in their series. No interest was shown in determining fines of minus 60 mesh.
4. In general about 80% of the participants in the survey used a pulverizing mill for grinding the sample in preparation for chemical analysis.

In discussing results of the survey with several fertilizer manufacturers, it was emphasized repeatedly that fertilizer manufacturers are greatly handicapped in production planning by inadequate and nonuniform raw material specifications. They stressed the importance of having correct data on chemical and physical characteristics of raw materials, presented in such terms as to be readily usable in plant formulations.

Moisture Data

In the case of moisture data, fertilizer manufacturers who granulate or agglomerate, need to know the amount of free water in the raw materials with a reasonable degree of accuracy. They point out that 100°C Moisture includes some combined water along with some volatile components. Hence, with this information, they can arrive at a free water figure from data supplied by the raw materials producer. They specify that composition data should clearly state how moisture is determined.

Free Acid

In ammoniation and granulation, identification of "Free Acid" is most important. The Free Acid in superphosphate is very likely present as phosphoric acid, and its role is to hold a portion of the free ammonia, which may be present in the formula. A chemical reaction takes place between these two components, yielding monoammonium phosphate. Since the system is phosphatic, many manufacturers prefer to express the Free Acid as "phosphoric." The questionnaire reported on the facing page shows that over 50 per cent of the fertilizer manufacturers surveyed report this value as "phosphoric acid."

Some raw material suppliers report Free Acid as "phosphoric," others identify it as sulfuric or as phosphorous pentoxide (P_2O_5). Fertilizer manufacturers interviewed point out that when the Free Acid is reported as sulfuric or as P_2O_5, it is necessary to make conversions to ascertain how much ammonia will be reacted with the free acid.

Another factor which affects the Free Acid figure, is the method of extracting the acid from the sample. Acetone extractant is sometimes used, because the value so obtained is approximately that obtained by the Absolute Ether method. Water may also be used as extractant, and according to the survey, 51.5% of the fertilizer producers reporting to the questionnaire, do use water. It should be cautioned, however, that if water is used as the extractant this value must be carefully evaluated. Factors influencing results obtained include the solubility and titrateability of mono calcium phosphate, particularly if the superphosphate is freshly made. However the Free Acid is determined, fertilizer manufacturers urge that they be informed of all factors affecting this value.

Particle Size

Since process efficiency is related to the Particle Size of materials going into the formula, fertilizer manufacturers agree that some uniformity should be developed if possible, in evaluation of this physical property. Although this is one of the most important factors in evaluating process efficiency, — it

nomenclature methods raw materials

is almost ironical that fertilizer manufacturers do not agree on what screen sizes should be used in classification. No two returns listed the same series of screens, and only 15% showed any agreement, in that they used screens 6-8-10-14-20. Others replying to the questionnaire used some of this series, adding either a 4 mesh, 60 mesh, and/or 100 mesh. Personal discussion with some fertilizer manufacturers indicates that a desirable standard series might be 4-10-20-60-100 (W. S. Tyler series). Any additional screens desired for specific plant conditions could then be added to the "standard" set. These observations, of course, are just suggestions, and any agreement or standardization must necessarily be of a voluntary nature.

Replies to the questionnaire show some general agreement among fertilizer producers on size of sample used, method of reduction, and equipment used for screening. As reported in item number 5 of the survey, 50% replying use a 100-gram sample; allowing 3 minutes for granular products in shaking and 10 minutes for pulverant materials. As shown in replies to items 5 and 6, there is also some general agreement on screening and equipment for screening.

Fertilizer manufacturers observe that if chemical and physical data relating to fertilizer materials can be reported uniformly, the fertilizer manufacturer and mixer would then be able to formulate more closely. The plant superintendent would also be able to exercise closer control, and could conduct a more efficient operation, yielding a more uniform product.

SURVEY ON UNIFORMITY

Replies from 23 States and Canada are included.

1. Moisture Content

How is moisture determined and reported in your control laboratory?

Materials

70.0% Oven @ 100° C.
10.2% Vacuum
12.9% Other (not identified)
6.9% Air flow

Mixed Fertilizer

66.6% Oven @ 100° C.
7.0% Oven at temp other than 100° C.
10.2% Vacuum
13.1% Other (not identified)
3.1% Air flow

2. Free Acid

a) How is free acid content reported? (Expressed as:)

51.3% Phosphoric acid
37.8% Sulfuric acid
8.3% P_2O_5
2.6% Other

b) If free acid is reported in any category, other than as "phosphoric acid," is there any reason why expressing this determination as "phosphoric acid" would be inconvenient?

83.3% No
16.7% Yes

c) What is the extractant used?

42.4% Acetone
51.5% Water
6.1% Other

3. Sample Preparation

(13.7% of the replies did not identify sample preparation)

Raw Material

Mill — 80.0%
Other — 6.3%

Granulated Mixed Fertilizer

Mill — 81.4%
Other — 4.9%

Ammoniated Mixed Fertilizer

Mill — 76.7%
Other — 8.6%

Dry Mixed Fertilizer

Mill — 74.4%
Other — 11.9%

b) What is the mesh sample ground to?

35 mesh — 36.0%
30 mesh — 24.0%
20 mesh — 16.0%
over 35 — 24.0%

4. Particle Size

a) What are the testing sieve sizes used in determing particle size?

There was no uniformity in replies to this question. All replies listed a different series of screens.

5. Sample Information

a) Size of Sample

50.0% 100 grams
28.1% 200 grams
15.6% other
6.3% no reply

b) How is sample reduced?

89.2% Riffling
10.8% other

c) What equipment is used for screening?

72.2% Ro Tap
8.4% Hand
8.4% Tyler Portable Shaker
11.0% Other

6. Time of Screening

Granular Materials

61.4% 3 minutes
26.9% 5 minutes
11.7% other

Raw Materials or Powdered

65.6% 10 minutes
24.1% 5 minutes
10.4% other

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225 ATTEND FOUR-STATE MEETING

Among the factors governing the application of pesticides are droplet size, wind, temperature, and susceptibility of surrounding crops. No applications should be made if any of these factors is unfavorable.

by Loren H. Milliman

DRIFT in air application of agricultural chemicals, and chemical winter fallow of wheat were two of the major topics discussed at the second annual 4-State Aerial Spray and Dust Applicators Conference held in the Chinook Hotel, Yakima, Wash., Oct. 10 and 11.

Dr. Norman Akesson, University of California, Davis, dwelt on many of the technical considerations governing application of pesticides by air. Among these are droplet size, wind, temperature, and susceptibility of surrounding crops to the material being applied.

He advised his audience that no application be made if any of the factors were unfavorable and a susceptible crop was within 500 feet of the area to be flown over, depending on the height to be flown. His address was in the nature of a progress report in which he acknowledged excellent cooperation from a number of chemical companies.

More than 225 aerial applicators and others associated with the industry attended the two-day session, coming from California, Washington, Oregon, Idaho, Montana and Canada.

Two speakers dealt with chemical winter fallow in wheat, where weeds are controlled following harvest by applications of two pounds each of 2,4-D and aminotriazole per acre in the semi-arid intermountain area. Erosion is markedly lessened, more moisture is retained in the soil because it is not disturbed following harvest, and there is less soil compaction because no equipment is rolling over it.

Speakers Stress Point

This latter point was stressed by many speakers in addition to Dr. Richard Fosse, American Chemical Paint Co., Nyles, Calif., and Dr. Tom Muzik, department of agronomy, Washington State University, Pullman, who talked on chemical winter fallow. Dr. Muzik dealt particularly with effects of some of the newer weed killers on cheat grass and other plant pests in the grain fields.

Although the phrase "soil sterilants" frightens some, Dr. Muzik pointed out that small applications per acre controlled the weeds without harming the soil.

Control of dodder in alfalfa with granular formulations of Chloro IPC, as has been demonstrated in Idaho, was explained by Arthur Wilson, Columbia-Southern Chemical Corp.

Effects of adjuvants and the necessity of selecting the right material for a given job were detailed by Dr. Virgil Freed, associate chemist, Oregon State College, Corvallis.

Coming as the personal representative of Dr. Max Goebel, director of research, industrial and biochemicals divisions of Du Pont, Wilmington, Del., Peter Poulos told of some of the problems that must be overcome as a new product moves from the laboratory into field use. Many adjustments must be made in formulations to provide a trouble-free material that will meet the demands of use by applicators and farmers, he said.

Proper Sequence Important

John Mueller, Yakima, Union Carbide Corp., developed these ideas further in his talk to the conference, pointing out how manufacturer's representatives on occasion go out into the field to be sure that applications of the new materials are made properly. Following the directions on the label—even emptying the materials into the hopper in the proper manner and in the correct sequence—are vital to success (and possibly to

the continued health) of the operator.

Recent developments in foliar application of nutrients were outlined by Dr. Ogden Riddle, Agricultural Chemicals, Inc., Davis, Calif.

Dr. Edward Chandler, Diamond Alkali Co., Cleveland, Ohio, told of new approaches to granular formulations and their uses in the field. He traveled to Yakima especially to address the group and to show the high percentage of weed control obtained, for example, by 2,4-D in a granular surface application on the soil.

Master of ceremonies at the luncheon the first day was Dr. Horace Telford, chairman of the department of entomology, Washington State University. Principal speaker at the noon session was Dr. Ray Fleek, Seattle restaurant owner, who told of the need for improved public relations on the part of the aerial applicators.

The second day's program was at the Yakima municipal airport where the very latest in aerial application equipment was on display and was demonstrated. Among planes displayed and flown were the AgCat from Bakersfield, Calif.; the Rawdon, Tekoa, Wash.; the Callair, Afton, Wyo., and the Piper Pawnee, in addition to a number of helicopters. All were flown in demonstrations, then those attending the conference were permitted to test fly the plans themselves.

Quick Dumping Shown

Demonstrations included how slowly the planes could fly and land and the even pattern obtained with sprays and dusts. Quick dumping of loads to meet emergencies was also demonstrated.

It was pointed out that airplanes are very important to the farmer in insect and weed control, playing a vital part in that work. This is particularly so when timing is vital—if the crop is at the right stage for a given treatment, or an insect or fungus pest or weeds threaten to get out of hand.

The invaders can be held in check without running heavy equipment over the ground, and it is possible to make the needed application of agricultural chemicals when it might not be possible to get into the fields otherwise.

One of the highlights of the conference was the showing of moving pictures of the flight of the X 15. This filled the meeting room to capacity with many standing along the walls.

In addition to the displays at the airport, there were exhibits by agricultural companies and equipment manufacturers on the mezzanine floor of the Chinook Hotel.

Cooperation of the aerial applicator's associations from the various states and the aviation divisions of the state governments was excellent, commented Dr. Robert Jones, Yakima, president and general manager of Norkem, who was the prime mover in arranging for the two conferences. Plans are already being formulated for the third annual conference.★★

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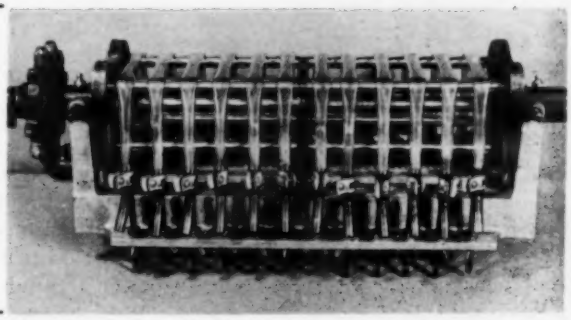
HOSE PUMPS

FOR APPLYING FERTILIZER SOLUTIONS

Hose pumps can be used for making surface or subsurface applications of fertilizer solutions before or at the time of planting, for applying the solutions as side-dressing or top-dressing, and for applying them to crop residues that are to be plowed under.



Commercial model of metering hose pump. USDA photo.

FERTILIZERS in liquid form are easy to handle and compare favorably in cost with dry fertilizers. Until recently, however, there has been a need for special application equipment that often brought the cost of using liquids up to a point where its advantages were outweighed.

The development of a hose pump, however, that uniformly measures fertilizer solutions or nitrogen solutions, makes it possible for applicators to use their existing equipment. The pump itself is inexpensive and can be mounted easily on a tractor or on a tractor-drawn implement. It weighs about 25 pounds.

Hose pumps can be used for making surface or subsurface applications of fertilizer solutions before or at the time of planting, for applying the solutions as side-dressing or top-dressing, and for applying them to crop residues that are to be plowed under.

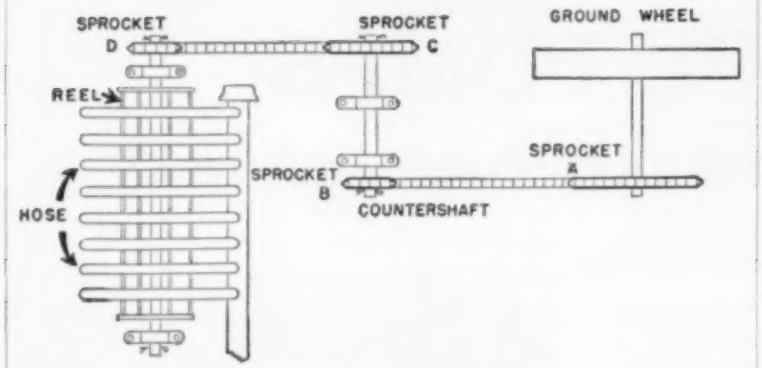
The pump consists of 1 to 12 or more flexible, plastic-type hoses that are stretched over a four-roller reel. It is connected to a supply tank by a feed line. The tank must be open or vented during field

TABLE 1.
Rates of application of plant nutrients per acre converted to gallons

Weight of dry fertilizer of similar analysis per acre (pounds)	Mixed fertilizer solutions: Equivalent gallons [1] and net application of plant nutrients										Nitrogen fertilizer solutions				
	8-8-8				5-10-5				5-10-10						
	Gal.	Net lb.			Gal.	Net lb.			Gal.	Net lb.			Actual nitrogen per acre	Corresponding number of gallons of different nitrogen solutions			
														21% N	32% N	37% N	41% N
													Lb.	Gal.	Gal.	Gal.	Gal.
50	5	4	4	4	5	2½	5	2½	5	2½	5	5	20	8.9	5.6	5.5	5.1
100	10	8	8	8	10	5	10	5	10	5	10	10	25	11.1	7.1	6.8	6.4
150	15	12	12	12	15	7½	15	7½	15	7½	15	15	30	13.3	8.5	8.2	7.7
200	20	16	16	16	20	10	20	10	20	10	20	20	35	15.6	9.9	9.5	9.0
250	25	20	20	20	25	12½	25	12½	25	12½	25	25	40	17.8	11.3	10.9	10.3
300	30	24	24	24	30	15	30	15	30	15	30	30	45	20.0	12.7	12.3	11.5
350	35	28	28	28	35	17½	35	17½	35	17½	35	35	50	22.2	14.1	13.6	12.8
400	40	32	32	32	40	20	40	20	40	20	40	40	55	24.4	15.5	15.0	14.1
450	45	36	36	36	45	22½	45	22½	45	22½	45	45	60	26.7	16.5	16.4	15.4
500	50	40	40	40	50	25	50	25	50	25	50	50	65	28.9	18.4	17.7	16.7
600	60	48	48	48	60	30	60	30	60	30	60	60	70	31.1	19.8	19.1	17.9
700	70	56	56	56	70	35	70	35	70	35	70	70	75	33.3	21.2	20.4	19.2
800	80	64	64	64	80	40	80	40	80	40	80	80	80	35.6	22.6	21.8	20.5
900	90	72	72	72	90	45	90	45	90	45	90	90	90	40.0	25.4	24.5	23.1
1,000	100	80	80	80	100	50	100	50	100	50	100	100	100	44.4	28.2	27.3	25.6
													120	53.3	33.9	32.7	30.8
													130	57.8	36.7	35.4	33.3
													140	62.2	39.6	38.2	35.9
													150	66.7	42.4	40.9	38.5
													200	88.9	56.5	54.5	51.3

[1] Fertilizer solutions weigh from 9.7 to 10.3 pounds per gallon. For general usage, a value of 10 pounds per gallon is sufficiently accurate.

Figure 1. — Four-Sprocket Chain Drive



operation, and, to insure uniform application, it should be mounted one foot or more below the bottom of the tank. As the reel turns, the rollers move along the hoses. The hoses close when a roller comes in contact with them; they open again after the roller passes. The contact of the rollers with the hoses as the reel turns creates a pumping action that pulls and pushes the solution forward and discharges it at the open ends of the hoses.

When ready to operate, the hoses are stretched over the rollers tightly enough to prevent flow of the fertilizer solution through the hoses unless the reel is turning. When not in operation for long periods, the hoses should be loosened to prolong their useful life. For surface application, the hoses can be tied to any boom. For subsurface application, the hoses can be tied back of cultivator shovels, plows, or various types of fertilizer application shanks.

The rate at which the reel turns governs the amount of fertilizer discharged by each hose on the pump. One of the important characteristics of the hose pump is that there is a direct ratio of the speed of the reel to the amount of discharge of the hoses. In other words, increasing reel speed from 100 to 200 r.p.m. doubles the amount of fertilizer discharged.

The reel is turned by the ground wheel of the equipment on which the pump is mounted, or some equivalent drive. Sprockets on the reel and the ground wheel are connected by a suitable chain drive or other mechanical means of power transmission. The rate at which the reel turns, therefore, is in direct ratio to the rate at which the ground wheel turns. To change the rate at which fertilizer is applied to the soil, this ratio must be varied.

The ratio is varied by changing the size of the sprockets. This increases or decreases the number of times the reel turns with each turn of the ground wheel. If a two-sprocket chain drive is being used, an easy way to vary the ratio between the reel turns and the ground wheel turns is to change the size of the sprocket on the reel. To determine the reel-sprocket size needed for a particular job the applicator must decide on the per-acre rate at which he wants to apply fertilizer, he must take certain measurements, and make a few simple calculations.

The measurements needed are: the number of times the reel turns to discharge one gallon of fertilizer through one hose; the width of the field strip to be treated by one hose; and the circumference of the ground wheel.

The first step in the calculations needed is to multiply the number of gallons of fertilizer solution per acre by the number of reel turns per gallon by the width of the strip (in feet) by the ground wheel circumference (in feet) and

TABLE 2.

Relationship of computed ratio (R) to size of sprockets B, C, and D

R	B	C	D	R	B	C	D	R	B	C	D	R	B	C	D	R	B	C	D	R	B	C	D
.0417	12	8	16	.0673	8	7	13	.0972	9	14	16	.1327	7	13	14	.1738	9	14	9	.2333	6	14	10
.0420	11	6	12		13	14	16		12	14	12	.1333	6	8	10	.1746	7	11	9	.2344	8	15	8
.0424	11	7	15	.0682	11	9	12	.0982	8	11	14		10	16	12	.1750	8	14	10	.2381	7	15	9
.0429	14	6	10		11	12	16	.0992	11	12	11	.1346	8	14	13	.1758	7	16	12	.2400	10	24	10
	11	9	15	.0698	10	11	16	.1000	8	12	15	.1351	8	13	12	.1778	9	16	10	.2407	6	13	9
.0433	11	9	16	.0704	12	10	12		10	8	8	.1358	9	11	9	.1786	7	10	8	.2424	9	24	11
.0438	10	7	16	.0709	10	7	10	.1016	8	13	16	.1364	8	12	11	.1795	6	14	13	.2449	7	12	7
.0440	13	8	14	.0707	9	7	11	.1026	12	16	14	.1368	9	16	13	.1806	8	13	12	.2500	7	14	8
.0446	14	10	16	.0710	13	12	13	.1037	9	14	15	.1375	8	11	10	.1818	8	16	11		8	16	9
.0449	12	7	13	.0718	13	14	13	.1042	8	10	12	.1389	6	10	12	.1833	6	11	10	.2540	7	16	9
.0455	11	7	14	.0721	13	15	16	.1058	8	11	13	.1400	10	14	10	.1837	7	9	7	.2593	6	14	9
	11	8	16	.0729	8	7	12	.1067	10	16	15	.1414	9	14	11	.1846	10	24	13	.2619	6	11	7
.0458	10	11	24		16	14	12	.1071	8	12	14	.1429	13	24	13	.1852	9	10	6	.2637	7	24	13
	15	11	16	.0741	10	11	15	.1074	11	13	11	.1429	7	8	8		9	15	9	.2653	7	13	7
.0462	14	9	15	.0741	9	8	12	.1083	8	13	15		8	16	14	.1857	7	13	10	.2667	9	24	10
.0467	10	7	15	.0750	10	12	16		10	13	12	.1442	8	13	13	.1875	6	9	8	.2679	8	15	7
.0469	16	9	12	.0764	9	11	16	.1094	8	14	16	.1444	9	13	10		8	12	8	.2708	6	13	8
	16	12	16	.0774	12	13	14	.1100	10	11	10	.1455	10	16	11	.1905	6	8	7	.2727	8	24	11
.0473	13	8	13	.0778	9	7	10	.1111	9	8	8	.1458	12	14	8		6	16	14	.2778	6	15	9
.0476	12	8	14		12	14	15		12	16	12	.1477	8	13	11	.1923	6	15	13	.2857	7	14	7
.0481	13	10	16	.0788	11	13	15	.1122	7	11	14	.1481	9	16	12	.1944	6	14	12		7	16	8
.0485	11	8	15	.0795	8	7	11	.1125	8	9	10	.1500	8	12	10	.1948	7	15	11	.2917	6	14	8
.0486	9	7	16		11	14	16	.1136	8	10	11	.1515	9	15	11	.1964	7	11	8	.2963	8	24	9
	12	7	12		16	14	11	.1143	10	16	14		11	10	6	.1979	6	13	11	.3000	8	24	10
.0491	14	11	16	.0800	10	8	10	.1154	12	12	8	.1524	7	10	15	.1975	9	16	9	.3036	6	11	6
.0495	13	9	14	.0813	10	13	16	.1167	10	14	12	.1528	8	11	9	.1983	11	24	11	.3061	7	15	7
.0500	10	8	16	.0818	10	9	11	.1172	8	15	16	.1531	7	13	14	.2000	6	12	10	.3077	6	24	13
.0510	14	10	14	.0833	6	8	16	.1182	10	13	11	.1538	8	16	13		8	16	10	.3095	6	13	7
.0521	12	10	16		8	10	15	.1190	7	10	12	.1546	6	12	14	.2031	8	13	8	.3117	7	24	11
.0530	13	7	12	.0844	11	13	14		14	10	6	.1550	9	14	10	.2041	7	10	7	.3125	6	15	8
.0536	14	12	16	.0855	9	10	13	.1200	10	12	10	.1563	8	10	8	.2051	6	16	13	.3265	7	16	7
.0545	11	9	15	.0864	9	7	9	.1200	7	11	13	.1571	7	11	10	.2063	7	13	9	.3333	6	14	7
.0556	12	8	12	.0867	10	13	15	.1212	6	8	11	.1587	7	10	9	.2078	7	16	11		6	16	8
.0563	10	9	16	.0875	10	14	16		9	12	11	.1591	8	14	11	.2083	8	15	9	.3429	7	24	10
.0571	10	8	14	.0888	13	15	14	.1224	7	12	14	.1600	10	16	10	.2121	6	14	11	.3571	6	15	7
.0583	15	14	16	.0900	9	8	10	.1233	9	10	9	.1607	7	9	8	.2143	7	12	8	.3611	6	13	6
.0595	14	10	12	.0913	8	10	14	.1250	6	12	16	.1616	9	16	11	.2167	6	13	10	.3636	6	24	11
.0600	10	6	10	.0930	10	9	10		8	10	10	.1625	8	13	10	.2182	10	24	11	.3750	8	24	8
	10	8	15	.0939	11	8	8	.1270	7	8	9	.1633	7	8	7	.2188	8	14	8	.3810	6	16	7
.0612	14	12	14	.0947	10	11	12	.1273	10	14	11		7	16	14	.2222	6	8	6	.3889	6	14	6
.0615	16	8	13	.0950	9	10	12	.1282	6	10	13	.1646	7	15	13		6	16	12	.4000	6	24	10
.0625	12	6	8	.0953	10	14	15	.1286	7	9	10	.1667	6	8	8		9	16	8	.4167	6	15	9
	16	8	8	.0938	8	12	16	.1296	9	14	12		8	16	12	.2245	7	11	7	.4286	7	24	8
.0635	9	8	14	.0947	13	16	13	.1299	7	10	11	.1678	11	24	13	.2273	6	15	11	.4444	6	16	6
.0641	12	10	13	.0952	6	8	14	.1300	10	13	10	.1696	7	13	11	.2295	7	16	10	.4898	7	24	7
.0649	11	10	14		12	16	14	.1313	9	13	11	.1705	8	15	11	.2292	6	11	8	.5000	6	24	8
.0655	12	11	14	.0963	9	13	15	.1319	7	12	13	.1714	7	12	10	.2308	8	24	13	.5714	6	24	7
.0667	10	8	12	.0972	6	7	12	.1322	11	16	11	.1719	8	11	8	.2321	7	13	8	.6667	6	24	6

divide the product by 43,560. This will give the ratio between the rate at which the reel turns and the rate at which the ground wheel turns.

The number of gallons of fertilizer per acre can be determined from Table 1. For example, if the application required is 40 pounds (net weight) per acre of a 41 per cent nitrogen solution, the application rate will be 10.3 gallons per acre. This rate should be multiplied by 400 (assuming that is the number of reel turns it takes to discharge one gallon). If each hose is to treat one row and the width of the row is 3.5 feet, then the product of the first two figures should be multiplied by 3.5 and this product is multiplied by the ground wheel circumference. The latter figure may be determined by measuring the distance covered in ten wheel turns, say 125 feet, and dividing it by ten. The final product should be divided by 43,560 which, in this case, would provide a computed ratio of 4.14, which means that the reel turns a little more than four times with each turn of the ground wheel.

The second step, then, is to divide the size of the sprocket on the ground wheel by the computed ratio. This will give the sprocket size for the reel. For example: if the ground wheel has a 24-tooth sprocket and the computed ratio is 4.14 (24 divided by 4.14 equals 5.8), a six-tooth sprocket (the nearest size) should be used on the reel.

When using a four-sprocket chain drive similar to the one shown in Figure 1, the ratio between the reel turns and the ground wheel turns can be varied by changing the size of sprockets B, C, and D. Sprocket A, the drive sprocket on the ground wheel, should be left in place.

The size of sprockets B, C, and D are determined in the same way that one determines the size of the reel sprocket in a two-sprocket chain drive, but one item is added to the first step of the calculations (size of sprocket on the drive wheel). The procedure in this case is to multiply the number of gallons of fertilizer solution per acre (10.3) by the number of reel turns per gallon (400) by the width of the strip (3.5 feet) by the ground wheel circumference (12.5 feet) and divide the product by the number of teeth of the drive sprocket in the ground wheel (24 for instance) multiplied by 43,560. The computed ratio of reel turns to ground wheel turns in this example is .1725.

The second step is to use Table 2 to determine the size of sprockets B, C, and D. The table gives the size of sprockets to use with various computed ratios ranging from .0417 to .6667. For example, in this case the computed ratio is .1725. The ratio given in Table 2 that is nearest to the computed ratio is .1728. The other numbers on the same line are the size of sprockets to use. B should

(*Continued on Page* 80)

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AG CHEM

Washington Report

by Donald Lerch

THERE was unanimous agreement among speakers at the 27th annual convention of the National Agricultural Chemicals Association on one important point. It is that a better public understanding of the role of chemicals in and on foods is needed before the "chemical era" will come to fruition. Some differences of opinion on how to accomplish this were expressed at the meeting. But these were largely a matter of emphasis, not of objective.

Few U. S. industries can point to a record of service to agriculture and mankind equal to that of the agricultural chemicals industry. As Lea Hitchner, NAC Executive Secretary, has pointed out, literally thousands of people are alive today who would otherwise have had a shorter lifespan as a result of insectborne diseases. The quality of our food supply is more favorable to consumers than would otherwise be possible, because of chemical pest control. Yet, attacks against the chemical industry continue—coming in the main from minority groups.

One of the best ways to broaden the industry's communications base so the industry can present a more forceful case to the public, in the opinion of many, is to work on communications inside the industry. An army of well informed and articulate formulators, distributors, dealers and applicators can do much to broaden the base of public understanding. Add to this an articulate and forceful group of scientists in agriculture and related fields. Then the industry will have the tools with which to launch an information program that will get broad and deep penetration throughout all segments of our public.

Certainly much already has been accomplished by the Pesticide Industry, but even more remains to be done. The comments made by the writer as a speaker at the convention were based on thoughts shared by nearly all other speakers —that is, that effort must be intensified all along the line and more resources are needed to make the impact needed to keep the industry growing.

* * * * *

It's an axiom of business that when you have a sound, workable program, the big job is to get the most out of it. And the results of the National Plant Food Institute's Intensified Soil Fertility Program in Miami County, Ohio, bear this out.

NPFI has just reported that the ISF Program boosted fertilizer sales in Miami County, Ohio, 45% for the year ending June 1960. Sales in an adjoining "control" county went up only 19%.

What makes the program outstanding, as seen from Washington, is that it has become an established part of the Extension Service program. Ohio Agricultural Extension Service Director Wilbur Wood calls the Miami County program "the new look" in extension activities, "based increasingly on university-industry joint action and cooperation."

Significantly, too, when farmers in Miami County were asked to name their most important source of fertilizer information, about 36% named the fertilizer dealer or salesman. In the control county, only 16% named fertilizer dealers or salesmen first; 30% named friends and neighbors.

Not only is the ISF Program selling more fertilizer, but it is boosting the prestige of dealers and salesmen as sources of information. With this gain in mind, next year's program in Miami County will center on equipping fertilizer dealers to make better use of soil sampling, soil testing and demonstrations to get farmers to use fertilizer correctly and make fullest use of their soil resources.

* * * * *

The entire agricultural chemicals industry is bound to be aided by growing efforts of the Manufacturing Chemists Association to inform key home economists, food editors, nutritionists, and others correctly on food additives.

Under the overall direction of MCA's Director of Public Relations, Allan E. Settle, MCA has sent out thousands of copies of FDA's "What The Consumer Should Know About Food Additives," FDA's folder "Food Facts vs. Food Fallacies," the President's Science Advisory Committee's "Report of the Panel on Food Additives" (the Kistiakowsky Report), an editorial from "Science" on the

Delaney Clause, the Super Market Institute's "The Good in Your Food," and NAC's popular "The Open Door To Plenty."

Both MCA and NAC are pleased with the impact of this program so far. More than 550 requests for anywhere from 1 to 350 additional copies of the materials have been received from home economics teachers, State Health and Welfare officials, medical officers of trade unions, and others.

Most significant were comments from a State Extension Service Specialist, who wrote, "This booklet (The Good in Your Food) came just in time to furnish me with some very fine quotable materials for our training course for County Home Demonstration Agents," and from a home demonstration agent, who wrote, "Thank you for the two booklets Open Door To Plenty and The Good In Your Food. Both books will be a great help to me in my 1961 program as a reference. On radio, in my newspaper column and with adult groups I will find the information most useful."

Allan Settle reports that the MCA program of informing vitally important home economics and nutrition groups on food additives is being broadened even further for the coming year.

* * * * *

Federal Aviation Agency efforts to set up a system of certifying aerial applicators will move another step forward at a conference slated for Oklahoma City, November 29 and 30. The idea of certification of approved applicators by FAA was first brought into the open by Jay McCausland, of FAA's Bureau of Flight Standards, at NATA's 1959 annual meeting a year ago.

A first conference on the subject was held in Washington last May. FAA's idea is to certify applicators who meet certain standards as to manual of operations, equipment, and so on. This will be tantamount to granting a license to do business. Discussions over how to set standards for applicators are likely to keep FAA certification in the talking stage for some time to come, however.

* * * * *

The Federal Aviation Agency conclusion that the October 4 airplane crash in Boston which took 62 lives was caused by migrating starlings raises a serious problem for bird lovers and for the public.

On farms and in gardens, plants which are out of place are called weeds. Efforts are made either to eradicate them or to keep them out of undesirable locations for the benefit of man.

In a world rapidly becoming more crowed with people, the same kind of public judgment may be applied to birds which get into locations where they are not desired; where they can threaten needed food crops or human lives.

This has long been the view of farmers and is a view held by many farm leaders who weigh feeding humans and protecting human lives as a shade more necessary to human welfare than protecting birds. In fact, we understand there are a few little known laws on the books which permit farmers to shoot some birds out of season if they attack crops.

These hard facts will not be accepted with grace by the "Bird-firsters." But there they are.

* * * * *

Communist China appears to be catching on to the importance of pest control in raising vegetables. The newspaper "Ta Kung Pao" featured a front page article September 20 which told Red Chinese peasants, "Insect pests should be fought with emphasis on both prevention and extermination. Complacency in this work should be opposed. At the very beginning of the development of insect pests, concentrated efforts should be made to insure their extermination before they can do any harm." and adds, "It is absolutely necessary to have an adequate supply of agricultural chemicals to reap a bumper harvest of autumn vegetables."★★

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Ontario — Subject company was starting up a new plant. IMC's Johnson and Franklin assisted in the original installation of equipment. The plant was put on stream and the customer went into immediate continuous production using IMC's formulations.

Florida — Subject company requested help in the granulation of X-O-X grades using Sul-Po-Mag. Mr. Causey was dispatched to assist in the proper production of this product.

Arkansas — Subject company was almost completely destroyed by fire. On Monday, IMC Technical Service was requested to assist in engineering and rebuilding the plant. On Friday, Mr. Robert Heck presented the customer with completed preliminary layouts.

Iowa — Subject company requested immediate engineering assistance for construction of a second shipping mill including simultaneous operation of bagging fertilizer and loading bulk trucks. IMC's De Long, with the assistance of IMC engineering, prepared completed drawings for this installation in one week's time.

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Plan to attend the IMC Technical Training Meetings — one of which will be close to your city. Check below for times and places.

CITY	DATE
Minneapolis, Minn.	Monday, Tuesday, October 24, 25
Indianapolis, Ind.	Wednesday, Thursday, October 26, 27
Baltimore, Md.	Wednesday, Thursday, November 9, 10
New York, N.Y.	Monday, Tuesday, November 14, 15
Raleigh, N.C.	Wednesday, Thursday, November 16, 17
Toledo, O.	Monday, Tuesday, November 21, 22
Winter Park, Fla.	Monday, Tuesday, November 28, 29
Montgomery, Ala.	Wednesday, Thursday, November 30, December 1
Kansas City, Mo.	Monday, Tuesday, December 5, 6
Tyler, Tex.	Monday, Tuesday, December 12, 13
Jackson, Miss.	Wednesday, Thursday, December 14, 15

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FO-3-01

AG CHEM LISTENING POST

by Paul Miller

This department, which reviews current plant disease problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Epidemiology Investigations, Crops Protection Research Branch, USDA, Beltsville, Md.

Breaking the Life Cycle of the Bentgrass Nematode

DURING the past 10 or 15 years the bentgrass nematode, *Anguina agrostis*, became a serious factor in the coastal area of southwestern Washington and northwestern Oregon, a major bentgrass seed-producing area. Fields in this area became so badly infested that seed yield was reduced by as much as 75%, according to Walter J. Apt, H. M. Austenson, and Wilbur D. Courtney (1). In cooperative investigations of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture, and the Western Washington Experiment Station, Apt and his coworkers tried out several herbicides for possible usefulness in controlling the nematode.

Control depends on prevention of flowering of the host plant, a crucial period in the life cycle of the nematode. In place of normal seed, infected plants form galls that contain the infective larvel stage of the nematode. When rains start in autumn, larvae are released from the fallen softened galls and invade nearby bentgrass plants. The larvae cannot mature and reproduce unless they enter the developing flowers the following spring, and they die if they cannot reach a flower within a year. Thus, if flowering is suppressed or the inflorescence is destroyed or removed at an early stage, the nematode cannot complete its life cycle. Mechanical or cultural practices to prevent heading have not been completely effective; therefore Apt and his coworkers undertook the experiments with herbicides.

Six herbicides were tested in 1955. One application was made at the beginning of May, and a second, if used, in the middle of June. Three of the six chemicals gave promising results. These were 2,2-di-chloropropionic acid (dalapon); 1,2,-dihydro-pyridazine - 3,6 - dione (maleic hydrazide); and 3-amino-1,2,4-triazole (amitrol). Dalapon and maleic hydrazide each reduced heading by about 98%. Amitrol allowed considerable heading, but nematodes in the infected heads were killed. This effect indicated that amitrol may possess systemic properties.

Two other chemicals, 3-6-endoxohexahydrophthalic acid (endothal) and 4,6-dinitro-*o*-*sec*-butylphenol (DNBP), had little effect on heading. Results from 3-(*p*-chlorophenyl) - 1,1 - dimethylurea (monuron) were inconsistent.

Apt and his coworkers found the chemical control methods to be both more effective and less expensive than summer-fallowing or mechanical methods of suppressing heading of bentgrass. They concluded that growth-regulating substances have definite possibilities for use in controlling the bentgrass nematode.

Evaluation of Soil Fungicides

A number of secondary wound pathogens may invade the feeder roots of citrus trees penetrated by the burrowing nematode, *Radopholus similis*. The nematode is the primary cause of spreading decline, one of the most important diseases of citrus trees in Florida, but the secondary organisms may aggravate damage, according to R. C. Cetes and Rodney Whidden (2), of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture.

Cetes and Whidden made a preliminary search for fungicides that might be used for soil treatment to control such secondary rootlet invaders. As test fungus, they used *Fusarium solani* isolated from burrowing nematode-infected rootlets of citrus trees affected with spreading decline. Basis for evaluating the effectiveness of the treatments was survival of the fungus, at predetermined depths to 8 inches, in tubes of soil drenched with different concentrations of the chemicals tested.

Most effective of the materials tested were 31% sodium methyldithiocarbamate (Vapam); a 50% wettable powder formulation of 3,3,4,4 - tetrachlorotetrahydrothiopene-1,1-dioxide (DAC-649); and disodium ethylenebisdithiocarbamate (22% nabam). DAC-649 was more effective at lower concentrations and greater depths than nabam. Apparently the active ingredient of DAC-649 possesses fumigant properties, according to Cetas and Whidden, since at effective dosages the chemical gave similar results at all depths to 6 inches. On the other hand, the reduced effectiveness of nabam as depth increased undoubtedly was due to a gradual decrease in concentration as the solution drained through the soil, indicating that nabam lacks

fumigant properties and that, to be effective, it must reach the fungus in liquid form.

A 50% wettable powder formulation of *N*-(trichloromethylthio)-4-cyclohexene-1,2-dicarboximide (captan) was not effective even at high dosages. Captan is only slightly soluble in water, and most of it probably remains in the top soil layers when it is applied as a drench. Cetas and Whidden found, however, that some other soil organisms in naturally infested soil obtained from around the roots of spreading-decline-affected citrus trees were more sensitive to captan than *Fusarium solani*.

Broad-Spectrum Fungicides

Houston B. Couch and Laurence D. Moore (3), of Pennsylvania State University, tested several broad-spectrum fungicides for effectiveness in controlling melting-out *(Helminthosporium vagans)* of Kentucky blue-grass and Sclerotinia dollar spot *(Sclerotinia homoeocarpa)* of bentgrasses, bluegrasses, and fescues, two important diseases of turf grasses in Pennsylvania. The materials tested included some complex formulations containing cycloheximide, bis (dimethylthiocarbamoyl) disulfide (thiram), pentachloronitrobenzene (PCNB), *N*-(trichloromethylthio)-4-cyclohexine-1,2-dicarboximide (captan), *N*-trichloromethylthiophthalimide (Phaltan), or cadmium salts in various combinations. Seven fungicides tested against both pathogens were 2,4-dichloro-6-*o*-chloroanilino-*s*-triazine (Dyrene); 0.75% cycloheximide, 75% thiram (Upjohn GAB-5); 1.3% cycloheximide, 75% PCNB (Acti-dione RZ); 60% captan, 5% cadmium carbonate, 10% thiram (California Spray ML-372); 60% Phaltan, 5% cadmium carbonate, 10% thiram (California Spray ML-373); 50% 5-chloro-4-phenyl-1,2-dithole-3-one (Hercules 3944-H); and 50% 5-chloro-4-*p*-tolyl-1,2-dithole-3-one (Hercules 4223-H). In addition 50% captan (Orthocide 50-W) and a preparation containing 5% cadmium sebacate, 5% potassium chromate, 1% malachite green, 0.5% auramine, and 16% thiram (Kromad), two of the recommended formulations for melting-out, were included in the melting-out trials, and a 45% thiram-10% hydroxymercurichlorophenol formuation (Tersan OM) in the dollar spot tests.

Under the conditions of the experiments all materials tested controlled melting-out of Kentucky bluegrass and all except the two Hercules experimental formulations controlled dollar spot of Seaside bentgrass. Recovery of Kentucky bluegrass from melting-out was faster and turf was heavier when Dyrene, Upjohn GAB-5, or California Spray ML-373 was used.

Couch and Moore commented on the advantages of "single-package" formulations capable of controlling a wide range of turf grass diseases. Such materials are planned primarily to combine chemicals known to be effective against a number of diseases common in a particular area. They should be especially valuable to homeowners and to superintendents of parks, golf links, and similar large turf grass areas because, as compared with formulations effective against single diseases only, they make correct diagnosis of the trouble less important to resulting control, according to Couch and Moore.

Verticillium Wilt of Cotton

D. C. Neal and J. B. Sinclair (4), of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture, and the Louisiana Agricultural Experiment Station, respectively, following up some preliminary observations in 1958, in 1959 tested the effects of extra nitrogen, applied late in July at the rate of 32 pounds per acre of nitrogen from nitrate of soda, on the yield of 8 cotton varieties and strains planted in soil heavily infested with the Verticillium-wilt fungus. Yields ranging from 1.7 to more than 2 bales per acre were obtained. Six of the 8 cotton varieties and strains showed a reduction in amount of Verticillium wilt in treated plots. Neal and Sinclair concluded that an extra application of nitrogen may increase yields of cotton in certain areas infested with the Verticillium-wilt fungus.

Rhizoctonia Solani Isolates

In Louisiana, chemical treatments applied in the furrow for control of cotton seedling damping-off have given inconsistent results. The inconsistency might be due partly to environmental conditions and partly to differences in the casual organisms responsible in particular cases, according to J. B. Sinclair (5), of the Louisiana Agricultural Experiment Station. However, laboratory, greenhouse, and field investigations reported by Sinclair showed that an additional factor may be involved. In studies on *Rhizoctonia solani*, one of the causes of damping-off, he found that five different isolates of the fungus differed in sensitivity to pentachloronitrobenzene (PCNB), *N*-(trichlormethylthio)-4-cyclohexene-1,2-dicarboximide (captan), and 2,3-dichloro-1,4-naphthoquinone (dichlone), used alone or in various combinations. He concluded that the relative effectiveness of a test chemical against the particular strain of the causal organism present in the soil should be taken into account when results of in-the-furrow experiments are interpreted.

Toxicity of PCNB

Natale Zummo and A. G. Plakidas (6), of Louisiana State University, noticed defoliation of *Magnolia fuscata* in the vicinity of camellia plants around which a ground spray of a 75% wettable powder formulation of pentachloronitrobenzene (PCNB) had been applied for control of petal blight. On the fallen magnolia leaves, numerous dark-green circular spots, from pin-point size to 5 millimeters in diameter, were conspicuous on a bleached background.

In one case, the injury evidently resulted from spray drift to the

(*Continued on Page* 81)

PEST ROUNDUP

by Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U. S.

Late Season Insects Heavy in Some Scattered Areas

DAMAGING infestations of the corn earworm were reported from various areas of the United States during September. The insect was damaging corn in widely scattered areas of Oregon, with infestations averaging 60 percent in Umatilla County fields checked, and 60 percent ear infestation in Polk County. Infestation in canning corn in Utah County was 6-7 percent, with 35 percent tip infestation, in Box Elder County, 2-3 percent with 10 percent tip infestation, and in Cache County, 1-2 percent with 5 percent tip infestation.

Corn earworms were damaging soybeans in several states. Controls were necessary in several counties of Virginia and on late planted beans in Arkansas. In Tallada County, Alabama, one small soybean field was completely destroyed, while in several other fields the bean loss was 40-50 percent.

In most areas of Oklahoma, the corn earworm was causing damage to late-planted sorghums. Counts of 1-4 larvae per head were recorded in several counties. Sorghums in areas of Texas, Missouri, Kansas, and Alabama were attacked by the insect.

Heavy populations of the corn earworm on corn also were recorded from Delaware, Missouri, Nebraska, and Nevada.

The sorghum webworm caused damage to sorghum in several states during September. There was extensive damage in late-planted grain sorghum in most areas of Oklahoma. In some fields in south central and east central areas of the State, larval counts averaged 50 per sorghum head. Populations of the insect were very high in late sorghum in areas of Missouri. Several fields in the southwestern part of the State were completely devoid of grain, due to damage from the sorghum webworm and corn earworm. Experimental sorghum plots in Neosho County, Kansas, were heavily damaged by the insect and populations were recorded also in areas of Texas, Arkansas, Alabama, and North Carolina.

The fall armyworm, reported last month as being damaging, continued to cause losses over a wide area. All cover crops in Haywood County, North Carolina, were attacked by the insect, with counts up to 15-20 per square foot. In other areas of the State, millet, cane, and lawns were damaged. In Chesterfield County, Virginia, Sudan grass and fall rye were severely damaged. The worm was responsible for heavy damage to pastures and grain sorghum in various parts of Alabama.

Lawns and pastures were damaged severely by the fall armyworm in southern, central, western, and northern Texas. In Oklahoma, a wide variety of crops were attacked by the insect, with some newly planted fields of alfalfa in Pawnee County being destroyed. Crops also were damaged in eastern Kansas, southwestern Missouri, western Tennessee, Arkansas, and Louisiana.

The spotted alfalfa aphid increased sharply in several areas during September. Heavy populations were recorded on 15,000-20,000 acres of alfalfa in Los Angeles County, California. Damage was reported also from Sacramento County. Counts ranging from 0-15 aphids per sweep were made in several areas of Clark and Lincoln Counties, Nevada. The highest populations of the season were recorded in Kane County, Utah, and damage resulted. Populations increased rapidly in several Colorado counties, with an average of 2,000 aphids per 100 sweeps in Prowers County being the high count.

Heavy populations of the spotted alfalfa aphid were also recorded in the western part of Oklahoma. In southwestern Missouri, alfalfa field counts reached 75 per sweep, and in Ellis County, Kansas 140 per sweep. Light populations were reported from Nebraska and Illinois. The first collection of the aphid for the season in Washington was made at Burbank in Benton County. Collections were also made in Malheur County, Oregon, for the first time, as well as in Owyhee, Canyon and Payette Counties, Idaho.

The oriental fruit fly was reported last month to have been collected twice in Anaheim, Orange County, California. During the week of September 15-20, one female fly was taken in a trap at Carpenteria, Santa Barbara, Coun-

(Continued on Page 80)

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 11

Is Your Plant Ready To Operate on Schedule?

IT PAYS TO CHECK YOUR EQUIPMENT

Now is the time to make sure that your plant is in shape for continuous operation throughout the fertilizer production season. By checking your methods and equipment now you can help to avoid breakdowns, replacements, and other interruptions in output of fertilizer during the height of the season.

It is easier to avoid trouble than it is to correct it after it has occurred. Improvised repairs in mid-season are often followed by recurrence of the same production problems causing more delays. Too many of these delays can add up to a low output of tonnage at the end of the season. Here are some suggestions which may help you to keep your plant operating after a smooth start:

Keep Accurate Records

Failures of heavy equipment can be a serious problem. Parts, such as elevator chains, sprockets, gears, pinions, and bearings, are exposed to heavy strains, abrasion and corrosion. They should start the season in top-notch condition.

Keeping good records on the age and use of parts will help to indicate needed replacements. Squeezing a little more service from parts of doubtful vintage is often a costly procedure in many ways. Some times it takes quite a while to obtain new parts. For example, properly matched sets of large V-belts are often not readily available.

Inspection Needed Now

Now is the time to check specifications to avoid overloading belts, gears and chains. Also check the conditions and suitability of all fuses, overload releases, shear pins, pressure and vacuum relief valves, and pressure regulators. *Do not use the pressure regulator or the governor as safety valves.*

Plants, too small to employ specialists, sometimes have arrangements with local electricians, pipe fitters and machine shops to promptly handle emergency repairs. Inspections made now by these skilled men may avoid expensive breakdowns and shutdowns later. Equipment manufacturers often will oblige with inspections of their equipment to assure continued satisfactory performance.

Metering and Weighing

The accuracy of your operation is determined by your scales, meters and measuring tanks. Proper functioning of these metering and weighing devices can greatly influence your profit and loss picture. It pays to be certain that they are accurate.

Have on hand (with gaskets) spare glass metering tubes calibrated for all liquids they are likely to meter. Also, have spare glass tubes for measuring tanks and provide for frequent and thorough cleaning of *all* gauge glass connections. Be sure that all measuring devices are of ample capacity because bottlenecks here are drags on production.

Air Systems

In automatically-regulated air compressors, when the "ON-OFF" range is too limited, there is a strong probability that the unit is not delivering to maximum capacity and the motor may overheat. If the "OFF" pressure is too near the operating pressure, the receiver tank cannot function properly, because it does not build up a reserve capacity during low demands of operation. Always have the process air well below the safe range of all equipment and do not trust any pressure regulator or governor to double as a safety valve.

Make sure you have adequate air pressure in all tanks before starting the day's operations. Learn how long it takes to build up pressures at different liquid levels in the tanks.

Avoid High Pressures

If a centrifugal pump is not delivering sufficient volume, this may be caused by excess pressure on the pump's outlet. At

30 pounds pressure, the pump may deliver only half as much volume as at 25 pounds pressure, and may deliver nothing against 40 pounds pressure. The application of only a little air pressure at the pump's supply tank will usually correct the problem.

Avoid high pressures on centrifugal pumps. The system should be protected against excess pressure when positive displacement pumps, such as the piston or gear types, are used. All pumps are sensitive to vapor locking from air or gas. This problem should be suspected when any pump is handling any volatile liquid at temperatures that approach its boiling point.

Cold Weather Operations

Certain precautions are required in handling nitrogen solutions during cold weather, due to their tendency to "salt out" and block equipment when the temperature goes low. "Salting out" is easy to prevent, especially when the solution moves through short, well-insulated piping direct from insulated tank cars fresh from the nitrogen producer's factory.

If circumstances require operating below the specified "salting out" temperature of the particular nitrogen solution, a few simple safeguards may avoid serious consequences.

When the solutions arrive at your plant, have everything else in the process ready and waiting for the flow of the solutions to start and continue uninterrupted at normal rates.

For insurance, pour a few gallons of hot water over the valve at the tank car or storage tank to dissolve any salts that may block the valve. Then promptly open the valve wide and start operation.

For any prolonged shut-down, force the solution back into the tank and close the valve tightly while the air is passing through it, or drain the piping in any other fashion. For longer shut-down, disconnect the hose at the car to prevent filling the piping through leakage. Provision for similar tactics should be made at the storage tank.

Choose the Right Solution

Select the proper ARCADIAN® Nitrogen Solution for your particular requirements and prepare your equipment to extend its use right down to the temperature limitations.

Every precaution should be exercised to avoid blocking the piping with nitrogen salts. If this should occur, *never* use heats greater than those of boiling water or low pressure steam to re-dissolve the salts. Pipe joints at frequent intervals will facilitate this freeing operation. Avoid all possible pressure build-up while applying heat.

Air Line Problems

In cold weather, there is usually more difficulty with the air supply than with nitrogen solutions or acids. Where there is compressed air, there is water. Much of the water is condensed in the air receiver and this tank should be drained each day during cold weather. There are many good filters which will remove most of the moisture from the air before it enters the piping. However, enough moisture does enter the piping to create a serious freezing hazard.

To minimize this hazard, air lines should have a marked slope to some convenient receptacle for draining the accumulation of moisture. Frequent drain points in the air piping are highly recommended.

Some states outlaw the injection of alcohol into the air system and insurance companies take a dim view of this practice. In any event, no inflammable material should be injected into a high-pressure air system because it can cause an explosion.

The high heats of torches for thawing frozen air lines may be hazardous because steam can be pocketed at dangerous pressures. Where the air line is near the nitrogen solution piping, extreme care should be exercised in using high temperatures for thawing the air line.

Metering in Cold Weather

The specific gravities of the following ARCADIAN® Nitrogen Solutions increase about 1% for each 29°F. drop in temperature of the liquid: NITRANA® 2, 2M, 3, 3M and 7; URANA® 10, 12 and 13. Corresponding figures are 27°F. for NITRANA 6; 33°F. for NITRANA 4 and 4M; 50°F. for U-A-S® A; and 22°F. for U-A-S B.

It is well to consider compensating for the change in specific gravity for Anhydrous Ammonia, for it increases about 1% for each 6°F. drop in its temperature.

The viscosities of the above nitrogen solutions and of anhydrous ammonia are so low at all operating temperatures that no known meter is adversely affected. In changing the settings for flow meters to accommodate changes in specific gravity, note particularly that this is not a direct function of the two specific gravities.

However, the viscosities of some acids are severely influenced and these factors should be taken into account when they are being metered.

When you need technical assistance, contact Technical Service, Nitrogen Division, Allied Chemical Corporation.

Polyethylene Pipe Resists Corrosion in Liquid Lines

The outstanding chemical resistance of polyethylene pipe to most of the conditions of fertilizer manufacture makes this inexpensive plastic pipe worthy of consideration for use in liquid lines for corrosive materials.

Polyethylene is classified somewhere between rigid and non-rigid plastics. It is fabricated into many pipe sizes suitable for various pressure requirements. The common 1½ inch pipe size is available in pressure ratings from 75 to 150 pounds at 75°F. The higher molecular weight polyethylene and extrusion methods in use today permit polyethylene pipe to retain most of its strength in surroundings somewhat above 75°F. It is wise to separate or insulate it from steam pipes, hot water lines, or hot roofs.

Since polyethylene pipe is shipped in coils up to 100 feet in length, an installation may often be made with only two or three joints up to the meter or batch tank. Heavy wall pipe needs support only every six or eight feet, while the thinner 75-pound pipe requires much closer support—approximately every two feet. This thin pipe is often strapped down on a wood 2" x 4" fastened to wall studs or along a cement block wall.

Different Sizes Needed

The thin 75-pound pipe should be used only for the ammoniating solutions within this pressure range. For acids and nitrogen solution having the higher vapor pressure, the 100-pound pipe should be regarded as the minimum. Most acid is moved by pumps and these should be operated well below this pressure. The 1½ inch 100-pound polyethylene pipe costs about the same as 1½ inch extra heavy black iron, but avoids the cost of flanges every 20 feet in the iron pipe.

The black plastic insert fittings used with polyethylene pipe on water service are not suitable for corrosive chemical service. Insert couplings and adaptors should be of 316 stainless steel with two or three stainless steel clamps and stainless steel bolts and nuts at each joint.

When the clamps are unable to pull the pipe down tight enough over the insert fitting, heat must be carefully applied to soften the plastic enough to make a leak-proof joint. Hot water is often not enough, so an acetylene torch in continuous motion at least a foot away from the pipe must be used to soften the plastic slightly. Heat may also be used to relieve strain on bends, but sharp bends or curves should be avoided. Chafing of the pipe is easily avoided by placing rubber around the pipe under the straps.

Plastic pipe is excellent for absorbing vibration from a mixer; at least three feet of plastic pipe should be used for this purpose and if operating personnel are near, only high-pressure polyethylene pipe shielded for safety should be permitted. The shield may be opaque or of safety glass, depending on whether a meter has to be read at the location. Naturally, any chemical lines should be located away from machinery and electric wiring.

Present installations of polyethylene pipe have been entirely satisfactory, particularly in regard to minimum maintenance and sediment-free operation after shut-downs. Meters and sight glasses stay clean longer, and there is no corrosion from dust settling on the outside.

Availability of polyethylene pipe is excellent. *Further details and recommendations may be obtained from Technical Service, Nitrogen Division, Allied Chemical Corporation.*

HOW THE MAGNETIC FLOW METER WORKS

The common image of the electric generator is of a thing of metal and insulation, complete with armatures, field coils, brushes and wires. Paradoxically, in the magnetic flow meter we have an electric generator in which the moving fluid is the armature, the electrodes are the brushes and the field coils are outside the section of pipe in which the liquid flows. Electrical signals are small, and, therefore, the unit needs shielded wire, correctly installed, to avoid interference. Shown below is a cross-section diagram of a typical magnetic flow meter.

Easy To Read

The voltage generated in the magnetic flow meter is directly proportional (linear) to the velocity of the liquid. The net result, obtained by multiplying velocity by pipe area is a true volume flow meter which measures gallons per minute (or some other volume unit, such as cubic feet per hour) of the fluid *at its flowing condition.* Where a reading in weight units is desired, simply multiply the volume figure by the actual density in pounds per gallon or pounds per cubic foot of the liquid as it passes through the flow meter.

Since the fluid passing through the meter serves as the unit's armature, it must be able to conduct electricity. This need be only as much conductivity as is found in ordinary city water. In fact, in special design units even less conductivity may be used.

There could be occasions where it would be necessary to add a very small amount of high conductivity fluid to the main stream in order to get satisfactory flow meter operation. However, where ARCADIAN Nitrogen Solutions are used this problem cannot arise because these materials are excellent conductors and meter calibration is not affected by any change in liquid conductivity.

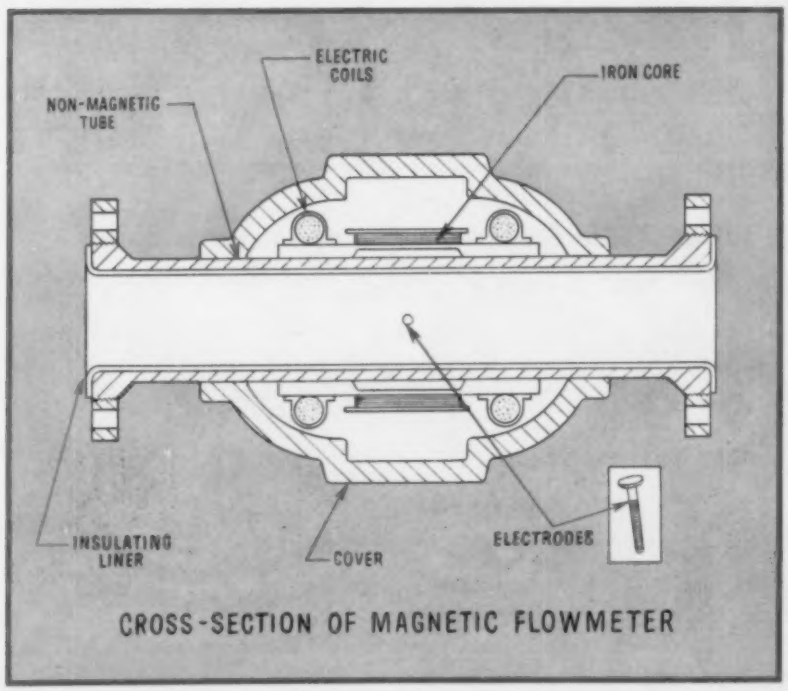
Meter Design Ideal for the Job

The magnetic flow meter is admirably fitted to its function. It has a smooth interior surface, lack of pressure loss and constant calibration. Changes in density of the liquid will not change the meter's volume reading. One hundred gallons of U-A-S® A produce the same reading as 100 gallons of NITRANA® 4, or any other ARCADIAN Nitrogen Solution.

The magnetic flow meter will measure flow in either direction, with the addition of a reversing switch. Units are available in almost any pipe size and can be hooked up to operate indicators, recorders, integrators and controllers located close by or at remote positions.

Outstanding Accuracy

The magnetic flow meter is remarkably accurate. Exhaustive tests measuring as much as 10,000 gallons at a time at Nitrogen Division's South Point plant have shown that this flow meter has an accuracy that is better than one per cent of the flow reading. Tests also show that this meter measures volume so accurately that small quantities of entrained gas are included in flow readings. *For more information on the operation and maintenance of magnetic flow meters, write Technical Service, Nitrogen Division, Allied Chemical Corporation.*



CROSS-SECTION OF MAGNETIC FLOWMETER

Arcadian® NITROGEN SOLUTIONS

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
DURANA®									
DURANA is a trade-mark of Allied Chemical Corporation.	37.0	13.3	53.4	15.9	9.4	7.2	1.235	0	36
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

*DURANA contains 8% formaldehyde.

Other ARCADIAN® Products: URAN® and FERAN® Solutions • Ammonia Liquor • N-dure® A-N-L® • Ammonium Nitrate • UREA 45 • Nitrate of Soda • Sulphate of Ammonia

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

NITROGEN DIVISION

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San Francisco 4, Cal., 235 Montgomery St. ..... Yukon 2-6840

NEWS ABOUT THE AG CHEM TRADE

Chemical Activities Merged

Standard Oil Co. of California has consolidated its industrial and agricultural chemical activities into one subsidiary, California Chemical Co. The new organization now coordinates and manages the manufacturing and marketing affairs previously handled by California Spray-Chemical Corp. and Oronite Chemical Co., and all of Standard's foreign chemical affiliations and marketing offices.

Calspray and Oronite now are the Ortho and Oronite divisions of California Chemical Co. H. J. Grady, formerly president of Calspray, is president of the Ortho division and T. G. Hughes, president of Oronite Chemical Co. for many years, is president of the Oronite division. Fred Powell, formerly vice president of manufacturing for Standard's Western Operations, Inc., was named president of Cal Chemical several months ago. Both Ortho and Oronite will continue to manufacture and market their product lines under their respective brands.

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Fertilizer Firm Purchased

Ris-Van, Inc., Belmond, Iowa, has purchased the fertilizer plant owned by the Andrew Farm Store in Jefferson, Iowa, and plans to spend $140,000 expanding its facilities. When completed, it will have a daily capacity of 1,000 tons of fertilizer.

•

Haifa Output Increased

The di-calcium phosphate plant of Fertilizers & Chemicals Ltd., Haifa, Israel, has been extended and its output has been tripled. The increase is expected to enable the company to export di-calcium phosphate.

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Hait Elected FMC President

James M. Hait, formerly executive president in charge of FMC's Ordnance Division and director of engineering, was elected president of Food Machinery & Chemical Corp., San Jose, Calif., last month. Mr. Hait joined the company as a mechanical engineer in 1928. He became chief engineer of the company's Peerless Pump division in Los Angeles in 1932 and, in 1946, he was appointed corporate director of enginering and elected a vice-president.

Ernest Hart retired as president of the company in June of this year and Paul L. Davies, board chairman and chief executive officer, has served as president since then.

•

GSA Purchasing DDT

The General Services Administration last month began purchases for the 1960-61 anti-malaria campaign by buying 11,124,800 lbs. of DDT at prices ranging from a low of 21 cents to a high of 23.39 cents a pound. It is expected that more than 60 million pounds will be purchased for the new campaign year.

Among the companies from whom the material was purchased are: Diamond Alkali Co., Cleveland; Food Machinery & Chemical Corp., New York; Geigy Agricultural Chemicals, Ardsley, N. Y.; Lebanon Chemical Corp., Lebanon, Pa.; Montrose Chemical Corp. of California, Los Angeles; and Olin Mathieson Chemical Corp., Baltimore.

Monsanto Names Three

Three managers of development have been appointed to share responsibility for the development department activities of Monsanto Chemical Company's new Agricultural Chemicals Division in St. Louis, Mo.

Named managers of development are Dr. Lawrence H. Hannah for herbicide products, Dr. Paul F. Hoffman for fungicides and insecticides, and Dr. Kenneth H. Maddy for chemical feed additives.

•

Plan Potash Production

Texas Gulf Sulphur Co., New York, has completed a core drilling program to evaluate potash reserves obtained by the company from Delhi-Taylor Oil Corp. The reserves are located at Cane Creek in southeastern Utah near the town of Moab.

The drillings "fully confirm a very large potash deposit believed to be richer than any other known to exist in the United States," according to Claude O. Stephens, president of Texas Gulf. Mr. Stephens stated he would "strongly recommend" that his directors authorize company diversification into potash, "if studies nearing completion yield final reports as favorable as all interim reports have been." Texas Gulf would plan to invest "from $20 million to $30 million" to construct facilities in Utah for producing commercial potash from the new source.

Texas Gulf recently paid Delhi-Taylor some $500,000 for an option to acquire these lands from Delhi-Taylor. Texas Gulf has until Jan. '61 to exercise the option.

PAILS and DRUMS
For Agricultural Chemicals

- Pail Sizes—1 through 13 gallons
- Drum Sizes—13 through 65 gallons
- All styles—Open-Head, Closed-Head
- All popular Pouring and Filling Openings (UPressit caps and seals, screw caps with pull up spouts or Flex-spouts, as required.)
- Bolted or Lever Closures
- Standard Specifications
- Hi-Bake Protective Linings
- Lithographed, or your choice solid color exterior
- Speedy delivery from stocked warehouses
- Samples furnished on request

PAILS

Sturdy construction. Chimes completely coated. Corrosion resistant. Fine quality steel. Standard specifications. (Furnished in all guage steel as required).

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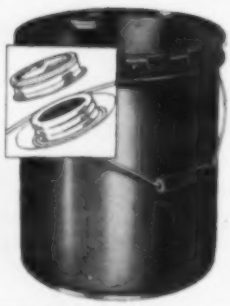

Open-Head with popular pouring spouts. Hi-Bake lined or unlined.

Drum-type Closed-Head. Top and bottom double-seamed. Side seams welded.

Drum type. Available with all popular pouring spouts. Offset at top for solid stacking.

Expert LITHOGRAPHING. Your Name, Trade Mark or sales message in perma-colors.

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AGITATOR DRUMS

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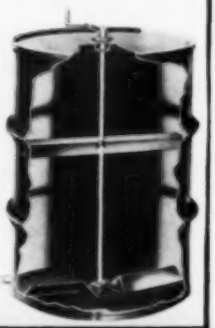

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Fall Boll Weevil Control

A large-scale experiment to destroy boll weevils as the insects prepare for hibernation is being conducted in several southern states this fall by the U. S. Department of Agriculture's Agricultural Research Service and the Agricultural Experiment Stations in Texas, Mississippi, Louisiana, and South Carolina, with financial assistance from the National Cotton Council.

The experiment is designed to strike the weevil in the diapause stage of its development. It is hoped that insecticides applied in the fall can destroy the weevils before they are in complete diapause and ready to hibernate. Malathion will be applied, two to four times at about 10-day intervals before frost, on some 1,200 acres of cotton in Texas, 250 acres in Louisiana, 25 acres each in South Carolina and Mississippi, and possibly 10 or 15 acres in Arkansas. Similar treatments in tests last year on 525 acres in Texas resulted in almost complete kill of weevils.

•

Formulations Symposium

The Pesticide Subdivision of the Agricultural and Food Chemistry division, American Chemical Society, will sponsor a symposium at the ACS Spring Meeting of 1961 to be held in St. Louis. The symposium will deal with new trends in formulation of pesticide chemicals.

Those interested in presenting a paper at the symposium have been asked to submit abstracts, before Dec. 5, to Marshall Malina, Velsicol Chemical Corp., 330 East Grand Ave., Chicago 11, Ill.

•

Southern Weed Conference

The latest developments in the use of herbicides to control weeds in all phases of southern agriculture will be presented and reviewed during the fourteenth annual Southern Weed Conference scheduled to be held at the Hotel Soreno in St. Petersburg, Fla., Jan. 18-20, 1961.

Dr. R. A. Darrow of the Texas Agricultural Experiment Station College Station, Texas, is conference president.

•

Monsanto Purchases Plant

Monsanto Chemical Co., St. Louis, Mo., has acquired title to the Army Chemical Corps plant adjacent to Monsanto's William G. Krummrich plant in Monsanto, Ill. The acquisition involves production facilities and a 15.7 acre tract of land. Monsanto has been leasing the facility from the government to manufacture agricultural chemicals and oil additives.

During World War II, the Chemical Corps plant was operated for the U. S. Army by Monsanto. Early this year, the U. S. General Services Administration had declared the plant surplus.

India Fertilizer Consultant

Dr. Raymond Ewell, Vice-Chancellor for Research at the University of Buffalo, has been appointed as consultant to the Government of India on the fertilizer industry under the auspices of the Ford Foundation for a period of four months. He is on leave of absence from the Univ.

Dr. Ewell is working with the Ministry of Commerce and Industry and the Ministry of Food and Agriculture of the Indian Government in formulating plans for expanding the fertilizer industry during the next five years.

On his way to India, Dr. Ewell stopped in Rome to confer with officials of the United Nations Food and Agriculture Organization and in Tehran to confer with Iranian Government officials.

Needs Of Agriculture Discussed At S.E. Meeting

A PANEL discussion of the topic "What Does Agriculture Need" was a feature of the fifth Southeastern Fertilizer Conference, Oct. 5 and 6, at Atlanta, Ga.

Appearing on the panel to discuss better public relations, L. Y. Ballentine, Commissioner of Agriculture for North Carolina, said that the need now is for concerted public relations activities on the part of the whole agricultural "family." Farmers, he pointed out, by the nature of their employment, do not have anything like the contacts that other businessmen have, nor do they have the long experience in public relations knowhow. "You in the 'agri-business' world," he said, "can do much to change the popular idea of farming through your sales and other business contacts, through your advertising, through your own public relations programs, through your civic or social group affiliations, and your everyday activities."

Dr. Robert Q. Parks, general manager, Nitrogen Products Division, W. R. Grace & Co., discussed the industry's responsibility for the future of agriculture. The fertilizer industry, he said, has the obligation to sell to farmers the kinds and quantities of fertilizers they need for most profitable production.

"We are not discharging that obligation," he declared, "because we are not selling enough fertilizer." Dr. Parks added that the fertilizer industry also has a responsibility to the research and extension agencies, whose results and efforts are needed to make the farmer's use of fertilizers most profitable.

Referring to the question of agricultural legislation, Rep. Donald R. Matthews, Florida, said, "I think what we need more than anything else in America, insofar as agricultural legislation is concerned, is an honest, insistent, whole-hearted efforted on the part of all our farm organizations (such as the American Farm Bureau, the National Farmers Union, and the National Grange) to try to come to some area of agreement. If we could find a more adequate common approach, we could certainly have no difficulty in getting any additional legislation that we need to meet the demands of that approach."

IMC Earnings Up 21 Per Cent

International Minerals & Chemical Corp., Skokie, Ill., has announced that earnings for fiscal year 1959-60 rose 21 per cent over the previous year. Sales were up 10 per cent.

The year was the first year of operation for the Agricultural Chemicals Division, which combined all production operations and all domestic sales functions of the former Phosphate Minerals, Phosphate Chemicals, and Potash divisions. Sales of the new division increased 13 per cent and were credited with being the major contributor to total corporate earnings. IMC sales of Florida rock phosphate in the domestic market increased 33 per cent.

•

Society Honors Stauffer

Hans Stauffer, president of Stauffer Chemical Co., last month was awarded the Society of Chemical Industry's gold medal for his "distinguished achievements in the industry." The award was presented at the Society's annual dinner in New York.

•

Foster Wheeler Cancels Job

Foster Wheeler Corp., New York, has canceled a contract with the Indonesian Government to build a $30 million fertilizer plant in Sumatra. Foster Wheeler reportedly had been ready to begin the project since May, 1959, when the contract was signed, but delays in negotiations for training Indonesians to operate the plant have held up construction and led to the cancellation.

•

C-VPFA To Discuss Residues

Discussions of the residue question will be a feature of the annual meeting of the Carolinas-Virginia Pesticide Formulators Association, Dec. 5 to 7 at the Carolina Hotel in Pinehurst, N. C.

Among those scheduled to speak at the meeting are: John W. Sanders Jr., director of the Atlanta District, FDA, "Establishing and Enforcing Pesticide Tolerances;" Dr. W. L. Popham, office of the administrator, Agricultural Research Service, USDA, Washington, D. C., "Responsibility for Use of Agricultural Chemicals in Agriculture;" and E. L. Chandler, manager of technical services, Agricultural Chemicals, Diamond Alkali Co., "Basic Manufacturer's Viewpoint Regarding the Residue Problem."

Also scheduled to speak is Jerald L. Dennis, manager of field sales, Naugatuck Chemical Co., who will discuss a sound marketing program.

Bowers Joins Foxboro

Walter S. Bowers, formerly with Standard Oil Co. of Ohio, has joined the Foxboro Co., Foxboro, Mass., and will specialize in sales promotion and instrument engineering.

While with Standard Oil, which he joined in 1948, Mr. Bowers organized an instrument team which he later developed into a control systems group responsible for systems design and plant control services. Previously he had been with American Cyanamid Co. as a chemical engineer and with H. K. Ferguson Co. as an instrument engineer.

•

NFSA Meeting Nov. 9-11

Speakers from the liquid fertilizer industry will cover many facets of product promotion at the 1960 annual convention of the National Fertilizer Solutions Association, Nov. 9 to 11 at the Peabody Hotel, Memphis, Tenn.

Among the speakers scheduled are Robert C. Lemler, Aylco Corp., Sullivan, Ill., "Selling the Farmer" and F. E. Hartzler, Kansas State Teachers College, "Management Practices." A panel will review the topics "Engineering Developments, Old and New; Water Soluble Phosphates; and Ten Years of Liquid Fertilizers." Appearing on the panel will be: Morris T. Woosley, West Kentucky Liquid Fertilizer Co., Hopkinsville, Ky.; Dr. John L. Strauss, Ris-Van Inc., Belmond, Iowa; Dean R. McHard, Kaw Fertilizer Service, Lawrence Kans.; and Demont Galbraith, Agriform of Northern California, Woodland, Calif. In addition, Roswell Garst of Coon Rapids, Iowa, will speak on the farm future.

•

Eastman Elects Ford

Henry L. Ford has been elected president of Eastman Chemical Products, Inc., Kingsport, Tenn. He succeeds Dr. L. K. Eilers, who has been named vice chairman of the board of directors.

Mr. Ford had been a vice president of the Tennessee Eastman and Texas Eastman Co. divisions of Eastman Kodak Co. divisions of Eastman Kodak since 1958.

Dow Opens New Agricultural Research Center At Midl. ıd

THE new Agricultural Chemical Research Center at The Dow Chemical Company was formally opened in Midland, Mich. the week of October 18th.

More than 120 educators and research men from agricultural colleges, federal government agencies, and commercial organizations toured the facilities along with Dow agricultural scientists.

An agricultural research symposium, "Research Horizons and Accomplishments," was held featuring Dow personnel and speakers from public agencies.

The new center will house all activities related to agricultural chemicals research at Midland. The building provides more than 50,000 square feet of laboratory and office space in addition to greenhouses and service buildings. The center is located on a 110-acre farm dotted with field test plots, animal barns and corrals, an orchard, and woody plant nursery.

The new facility is a major operational unit as well as headquarters for Dow's national network of agricultural research facilities, including the Texas Division laboratory at Lake Jackson, the Western Division laboratory at Seal Beach, California, and research field stations in Florida, Mississippi, northern California and Michigan.

Elected AIBS President

Dr. Tracy M. Sonneborn, professor of zoology at Indiana University, was elected president of the American Institute of Biological Sciences at the annual meeting of the governing board in Stillwater, Okla., Aug. 27. He succeeds Dr. James G. Dickson.

•

FMC Appoints Hopwood

Food Machinery and Chemical Corp., New York, has appointed Stafford L. Hopwood Jr. as assistant manager of its central chemical development department.

Dr. Hopwood joined FMC last year as a development engineer, working in the areas of acquisition and diversification studies and corporate planning. Before joining FMC, he was head of the research economics and planning section of the central research laboratories of Minnesota Mining and Manufacturing Co.

•

Southern Acquires Millhaven

Southern Nitrogen Company of Savannah, Ga., a manufacturer of nitrogen fertilizer products, has acquired the Millhaven Sales Corporation.

Millhaven operates anhydrous ammonia distribution and application facilities at six towns in southeastern Georgia. Purchase of Millhaven Sales marks Southern Nitrogen's entrance into the retail selling of anhydrous ammonia.

•

To Acquire Minnesota Firm

National Distillers and Chemical Corp., New York, has made arrangements to acquire the operating assets of Minnesota Liquid Fertilizer Co., Minneapolis, a distributor of anhydrous ammonia for direct application to the soil through 32 ammonia stations throughout Minnesota.

•

Ag. Engineers Meeting

The winter technical meeting of the American Society of Agricultural Engineers will be at the Peabody and Chisca Hotels in Memphis, Tenn., Dec. 4 to 7. The total number of speakers participating in concurrent sessions is expected to be more than 150. Some 1,200 agricultural engineers are expected to attend.

•

ESA Meeting In Atlantic City

The eighth annual meeting of the Entomological Society of America will be held in the Haddon Hall Hotel, Atlantic City, N. J., Nov. 28 to Dec. 1.

Davison Names Two

George H. Reid Jr., formerly administrative assistant to the assistant general manager, mixed fertilizers, has been made manager of the Curtis Bay, Baltimore mixed fertilizer plant of W. R. Grace & Co., Davison Chemical Division.

In addition, H. N. Greenlay has been transferred from Baltimore to New England as sales manager for the New England territory.

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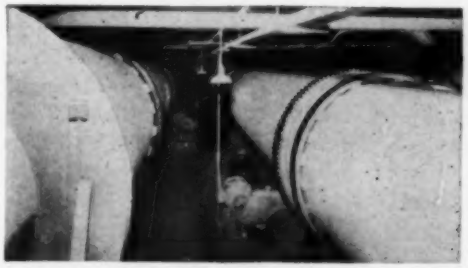
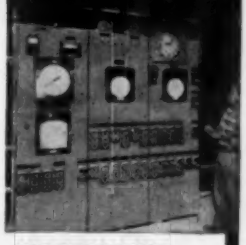


TWO RENNEBURG Heavy-Duty Rotary Units

Each 8' diameter x 50', with 50 HP fluid drives . . . for drying and cooling high analysis chemical fertilizers.



INSTRUMENT PANEL

"Nerve center" of this large Renneburg designed and equipped chemical fertilizer plant. Includes furnace pyrometer; temperature indicating, recording and controlling potentiometers; load indicating ammeter, and start-stop push button stations with signal lights for each machine. Audio-howlers warn operators of possible processing difficulties.

Literature and information on request.

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CFA Lists Meeting Program

The program for the 37th annual convention of the California Fertilizer Association, to be held at the del Coronado Hotel, Coronado, Calif., Nov. 13 to 15, has been released by the association.

Among the speakers will be: Tyler Macdonald, Hixson & Jorgenson, Los Angeles, "The New Look in Selling"; and Leon V. Tichinin, San Jose, Calif., "What I learned From 20,000 Russians in Moscow." Mr. Tichinin represented American agriculture at the 1959 American National Exhibit in Moscow. A panel will discuss the topic "The Fertilizer Industry – Yesterday, Today, and Tomorrow."

•

2nd Marketing Seminar

The second *Farm Chemicals* Marketing Seminar will be held Nov. 15 and 16 at the Delmonico Hotel in New York. Among the speakers will be John L. Gillis, Monsanto Chemical Co., Stuart H. Bear, Niagara Division, Food Machinery and Chemical Corp., and M. E. Wirenga, California Spray-Chemical Corp.

•

Dr. W. G. Reed Dies

Dr. W. G. Reed, formerly chief of the Pesticide Control Section of the U. S. Department of Agriculture, died Oct. 10 at the age of 65. Prior to his retirement in 1957, he had been with the USDA for 28 years.

•

USDA Grant To Poland

A grant of $6,176 has been made to the Institute of Plant Protection, Poznan, Poland, for research on biological control of insect pests, by the U. S. Department of Agriculture.

•

Allied Advances Harrison

William R. Harrison has been appointed northern district field sales manager for agricultural chemicals produced by Allied Chemical's General Chemical Division.

Mr. Harrison succeeds B. C. Macdonald who has been named supervisor of General's agricultural chemical development section with headquarters at the division's research laboratory in Morristown, New Jersey.

•

AP&CC Board Chairman

Peter Colefax has been elected chairman of the board of American

Peter Colfax

Potash & Chemical Corp., Los Angeles. He continues as president of the company.

•

32nd Eastern Branch Meeting

The 32nd annual meeting of the Eastern Branch, Entomological Society of America was held Oct. 27 and 28 at the Hotel New Yorker, New York. Among the speakers on the program were Dr. A. L. Taylor, Agricultural Research Service, USDA, who discussed nematodes of interest to entomologists in the eastern states; Floyd F. Smith, ARS, USDA, who reported on tests with combination insecticide-acaricide-fungicide treatments; and D. P. Connola, New York State Museum & Science Service, Albany, who told of aerial spray tests against gypsy moths in New York.

Also on the program was a panel discussion of the problems and responsibilities of different agencies with respect to insecticide residues. Charles E. Palm, Dean, New York State College of Agriculture, Cornell, moderated.

•

Pesticide Sales Manager

Robert C. Berry has been appointed sales manager – pesticide division for Miller Chemical & Fertilizer Corp., Baltimore, Md. Before joining the Miller organization in 1955, Mr. Berry had worked as an entomologist for S. B. Penick and Co., New York, and for Hercules Powder Co. of Wilmington, Delaware.

British Exports Up

In a report prepared by the Business and Defense Services Administration, U. S. Department of Commerce, it is brought out that exports of pesticide products from the United Kingdom in 1959 increased approximately 35.5 per cent in value over those of 1958, while imports declined in both quantity and value.

•

Expanding Bunker Hill Plant

Collier Carbon & Chemical Corp., Los Angeles, has started construction of an addition to the Bunker Hill Co.'s phosphoric acid plant in Kellog, Idaho. The new facilities will be owned by Collier, a subsidiary of Union Oil Co. of California, and will be used by Bunker Hill in manufacturing, exclusively for Collier, anhydrous liquid phosphate (ALP).

•

To Discuss Delaney Amendment

On November 18, 1960, the Kansas City Section of the American Chemical Society will present a special symposium on the "Scientific Basis of the Delaney Amendment" as a part of its twelfth annual fall chemistry conference to be held at the University of Kansas City.

The Delaney amendment states that no food additive will be deemed safe ". . . . if it is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal. . . . " The various effects of this amendment have been the subject of much controversy and publicity.

Dr. Dan McDougall, Chemagro Corp., who is chairman of the symposium, recently announced that the Delaney amendment will be discussed at the symposium by three speakers, one each from industry, government, and education. These speakers will be T. P. Carney, Eli Lilly Co., S. Roe, FDA; and P. R. Cannon, University of Chicago.

Sales Clinic Planned

Program plans have been completed for the Annual Sales Clinic conducted by the Salesmen's Association of the American Chemical Industry. The Clinic, scheduled for November 14, at the Hotel Roosevelt, New York, will take for its theme "How the Company Can Better Cooperate With the Field Salesman." This theme will be covered by three panels under the respective headings of "What Makes a Top Flight Salesman?"; "A More Effective Relationship Between Salesman and 1.) Product Management, 2.) Product Development, 3.) Market Research;" and "Multi-Level Selling and Relationships."

•

Hudson Appoints Brody

Howard Brody has been appointed product manager of Hudson Pulp & Paper Corp.'s multiwall division. He had been assistant division sales manager.

•

Canada Naphthalene Maker

Record Chemical Co. now is producing refined naphthalene with a minimum melting point of 79 deg. C in a new extension to its plant in Montreal. The company says that this step will make the Canadian market self-sufficient for the manufacture of such products as insecticides, tanning agents, die stuff intermediates, and plasticizers.

•

Division Traffic Manager

Robert G. Thorn has joined the Phosphorus Division of Hooker Chemical Corporation, as division traffic manager, a newly created position.

Mr. Thorn is located in Jeffersonville, Ind., headquarters for the division which has other plants at Adams, Mass., Columbia, Tenn., and Dallas, Texas; and also sales offices at Jeffersonville, Chicago, Ill., New York City, and Marysville, Ohio.

•

Sulfur Plant Operating

Production at the newly-formed Trans-Jeff Chemical Corp's sulfur plant in McMullen, Texas, was started last month. Trans-Jeff is a joint venture of the Transcontinental Gas Pipe Line Corp. and the Jefferson Lake Sulphur Co. Construction on the plant, near Tilden, Texas, began last June.

The facility is Trans-Jeff's first undertaking. At Tilden, Transco operates a treating plant to remove impurities from sour gas brought into the area. Trans-Jeff is recovering sulfur from the waste acid gas stream.

Agronomists Meeting Feb. 16

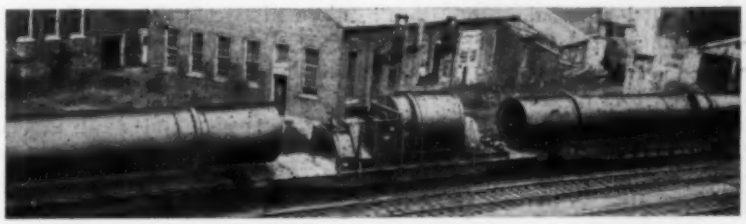
The conference of Midwestern Agronomists and Fertilizer Industry Representatives will be held in Chicago on Feb. 16 and 17.

•

Girdler Changes Name

Girdler Construction Corp., Louisville, Ky., has changed its corporate name to Girdler Corp. The company is a totally owned subsidiary of Chemical and Industrial Corp., Cincinnati.

Complete dryer and cooler installation on its way to a fertilizer plant by railroad. McDermott also has trucking facilities for direct-to-the-site delivery.



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Operator sits at computer control console in the master control room at Monsanto's Barton Plant. Processing data on the ammonia manufacturing operation issues from automatic typewriters linked to the complex electronic equipment. The typewriter on the table records selected signals which the computer might send to various controls along the process line and also any orders fed into the system by operators. The long-carriage typewriter setting atop the console cabinet is the "logging machine" which comes to life at intervals, tapping out instantaneous reports on operating conditions along the process stream. Thus, these two typewriters automatically provide a record of the plant operation, day by day.

Monsanto Demonstrates Computer-Controlled Ammonia Production

THE ultimate in computer-controlled ammonia production was demonstrated October 13th to press representatives at a seminar and plant tour of Monsanto Chemical Company's ammonia plant in Luling, La. The plant is unique in that a multistep process with all chemical processing steps is completely supervised by a computer.

The Luling, La. plant is one of two nitrogen plants comprising Monsanto's new Agricultural Chemicals Division. The other is located at El Dorado, Ark. This division of Monsanto also has three other plant facilities, one at Anniston, Ala., one at Nitro, W. Va., and one at Monsanto, Ill., producing pesticides and various feed additives. "At the Barton plant (in Luling), we have 400 people conducting a 24-hour a day, 365-day a year operation," observed H. L. Payton, Barton plant manager. "Our basic raw materials are natural gas, air and water. Primarily, we make ammonia. From ammonia, we make nitric acid, ammonium nitrate fertilizer and a complete line of nitrogen fertilizer solutions.

Lonnie Payton
Barton Plant Mgr.

T. K. Smith, Jr.
Vice President,
Ag. Chem. Div.

"Our ammonia plant is one of the largest and most modern in the world," he continued. "Our prilling plant is the largest ammonium nitrate pelleting facility in the world. Located on the river, with two major railroads on our property, we can and have shipped our products all over the world. However, our main customer is the domestic agricultural market, with about 90 per cent of our production sold in the central and southern states."

Monsanto's decision to investigate the application of complete automatic control to an ammonia plant was reviewed by Grant Russel, manager of the systems engineering section. Ramo-Wolldridge Corp. was commissioned in 1957 to study the question of whether or not a computer could be justified at one of Monsanto's plants.

Studies of plant operations and production variables, showed that theoretical expressions covering the required relationships did not exist and could not be readily developed. Thus, statistical studies had to be made of available plant data to determine empirical relationships between the various independent and dependent variables and plant operating parameters. This data was obtained and, in some cases, special plant runs were made to obtain sufficient data for a particular correlation.

"The computer project objectives of increased production and higher efficiency have been successfully accomplished," observed Mr. Russell. "The advantages of split-second calculation and control adjustment, complete and detailed observation of all process variables and extensive logging of data, far outweigh the disadvantages.

"Now that the computer installation is an accomplished fact, and a period of successful operation is behind us, it is natural to ask what conclusions can be drawn from this experience.

"Does this mean that every plant will soon have a computer? The answer is No. There are certain criteria of size and complexity which must be met before a computer is justfied. Our studies indicate that unless a relatively small percentage increase in profit will support the necessary investment, the plant is probably too small for digital computer control. If the preliminary studies show that large increases in yield or efficiency are possible, it is quite likely that these can be gained by engineering changes or better instrumentation."

The computer does not eliminate any jobs or replace any people. It is just a highly specialized new tool to aid our people

to do their jobs better, remarked L. Payton, plant manager.

The installation of the computer system will certainly make Monsanto a more dependable source of supply, since this plant will operate at optimum efficiency, observed G. G. Scott, Monsanto district manager, thereby enabling the company to better serve customers' needs during peak demand periods for anhydrous ammonium nitrate.★

•

FRANK MCGRANE has been appointed manager of the San Francisco office of American Potash & Chemical Corp. He has been with the company since 1955.

LEGAL NOTICE

Statement required by the Act of August 29, 1912, as amended by the Acts of March 3, 1933, July 2, 1946 and June 11, 1960 (74 Stat. 208) showing the ownership, management, and circulation of Agricultural Chemicals, published monthly at Baltimore, Maryland, for October 1, 1960.

1. That the names and addresses of the publisher, editor, managing editor and business managers are: Publisher, Industry Publications, Inc., P.O. Box 31, Caldwell, New Jersey. Editor, Eleanor Kanar, P. O. Box 31, Caldwell, N. J.; Managing Editor, Richard McNally, Box 31, Caldwell, N. J.; Advertising Manager, Ralph Dorland, P.O. Box 31, Caldwell, N. J.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Industry Publications, Inc., P.O. Box 31, Caldwell, N. J., Wayne E. Dorland, P. O. Box 31, Caldwell, N. J.; Ralph Dorland, P. O. Box 31, Caldwell, N. J.; Eleonore Kanar, P. O. Box 31, Caldwell, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are. (If there are none, so state). None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 4,888 copies. (This information is required by the act of June 11, 1960 to be included in all Statements regardless of frequency of issue.)

Signed—Wayne E. Dorland, Publisher

Sworn to and subscribed before me this 13th day of September, 1960.

(SEAL) David Tryon

(My commission expires May 11, 1964)

WEED 'em and FISH!

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Reasor-Hill Corporation, Box 36-AG, Jacksonville, Ark.

THOMAS H. CLEMENS has been appointed Arizona sales representative, Agricultural Chemicals Division, Stauffer Chemical Co. He will make his headquarters at Glendale, Arizona.

AC

JOE V. KERN has been named assistant to the resident manager of the United States Borax & Chemical Corp. potash mines and refinery at Carlsbad, N. M. Mr. Kern, who formerly served as field accountant, joined the company in 1951 as a clerk in the mine office.

ACS MEETING

(*From Page* 29)

Best results, he said, have been obtained by a combination of processes involving ammoniation at a high pH (8.0) followed by adjustment to a low pH (6.0) for storage. The products were slow settling, highly fluid, and free of large crystals.

Edward J. Fox. USDA, ARS, reporting studies conducted by himself and William A. Jackson, observed that principal contributors to sludge formation in wet process phosphoric acid are organic and fluosilicic acids. The former, he said, may be eliminated by dry or wet combustion and the latter by precipitation from freshly prepared acid. On standing, fluosilicic acid deposits solid hydrous silica, while the fluorine combines with aluminum to form a soluble complex salt. Conditioned wet process acid, might then be used satisfactorily in liquid fertilizers. Another technique, suggested by Mr. Fox, is to produce sludge-free wet process phosphoric acid by precipitating calcium as sulfate from an aqueous extract of ordinary and/or concentrated superphosphate.★★

FERTILIZER OFFICIALS

(*From Page* 32)

sumer. It was generally agreed that there should be a limit placed on the amount of label space that can be devoted to pictures and promotional material so that all required label information can appear on the package in readable form.

The increasing use of liquid or bulk dry fertilizers brought up the problem of the dealer who purchases a particular grade from more than one manufacturer and places all the material in one tank or storage bin. In the event of a discovered deficiency, there is a question as to who is held responsible. There seemed to be general agreement, however, that when a dealer mixes different products he becomes a manufacturer himself and must have the end product registered.★★

PESTICIDE OFFICIALS

(*From Page* 31)

valuable from an inspection standpoint. It was recognized, however, that a false impression might be obtained by misuse of the registration number in advertisements. It also was brought out that the use of a registration number on the package could instill a false sense of security on the part of the user. A final comment was to the effect that the use of federal registration numbers on packages might work a hardship on products that are sold only in one state and thus do not require a federal registration. This could conceivably reflect discredit upon these products in the eyes of the consumer.★★

EDITORIALS

(*From Page* 27)

the agricultural chemical industry's story across to the applicator. There are perhaps three to five thousand major applicators, aerial and ground, the professionals who apply the major portion of the insecticides used. If they do an efficient job with a first-rate product, insect control is a success. If they miss the mark somewhere along the line, insecticides and the insecticide industry get a black eye, and a new crop of scare stories

appears in the newspapers. Does the industry attempt to educate this important group as to what the new insecticides are, just how dangerous some of them are, how they can be successfully and safely employed, and what precautions must be observed in applying them? Or do they try to carry these same important messages to the few thousand large farmers and orchardists who use pesticides in large quantity?

The answer to our question is that so few pesticide manufacturers do anything along this line that they are definitely the exception. We see an occasional piece of expensive advertising copy in four colors in the *Saturday Evening Post* or *Fortune*, illustrated with giant insects and telling the thrilling story of some long-named product which is meaningless to Mr. General Q. Public. We see a few such half-hearted attempts to do the impossibly big job of telling the public all about insecticides,—but mighty little of the job which really needs to be done,—and can be done—and by this we mean telling the insecticide industry's story to formulators, dealers, applicators and other professionals in the insecticide business, who in turn can pass the message along to a widening circle, so that it will eventually seep down to the end user.★★

HOSE PUMP

(*From Page* 59)

be a 9-tooth sprocket, C a 14-tooth sprocket, and D a 9-tooth sprocket.

In addition, the rate at which fertilizer solutions are applied can be changed by changing the number of hoses used, or by changing to hoses that have smaller or larger diameters. (The calculations for determining sprocket sizes, and Tables 1 and 2, will apply regardless of the size of the hoses used.)

The compilations and tables used in this article were taken from a U. S. Department of Agriculture publication prepared by Charles W. Gantt, Jr. and Walter C. Hulburt of the Agricultural Engineering Research Division, Agricultural Research Service, USDA, and Henry D. Bowen of the Agricultural Engineering Department, North Carolina State College.★★

PEST ROUNDUP

(*From Page* 66)

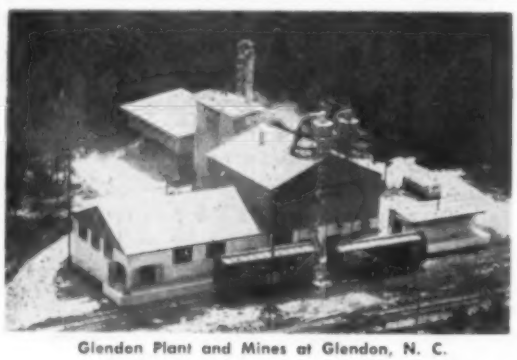
ty. These are the only three flies that have been taken. The trapping program is extensive and fruit inspection has been intensified in an effort to find larvae.

Among the vegetable insects, loopers perhaps caused the most concern during September. In Arizona, controls prevented damage to lettuce, even though egg counts were very high. Controls were also needed on lettuce in New Mexico. The insect was severe on cucumbers on the Eastern Shore of Virginia and on various vegetables in areas of Delaware.

Boll weevils and bollworms were the principal cotton pests during September. Due to scarcity of squares, the remaining ones carried high populations of boll weevils in most areas. Bollworms were of concern in practically all of the cotton sections. Reports from California east to Georgia stated that moderate to heavy populations were present.

Among the forest insects, pine and ips bettles were active over widely scattered areas. These beetles were responsible for the killing of ponderosa pines in the Glenco-Wilseyville area, Calaveras County, California. Damage by pine beetles was also reported from Alabama, North Carolina, and Virginia, and by the ips beetles from the latter two states.

The face fly continued to spread, with North Dakota being added to the list of states reporting the insect. White-fringed beetles were reported during September as being found for the first time in Beaufort County, North Carolina;



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Dusts compounded with Glendon's Insecticide Grade Pyrophyllite will not absorb moisture, nor will the carrier separate from the active ingredients during storage. It holds well on plant leaves, even during rain, and when dusted from the air, settles rapidly, minimizing drift.

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P. O. Box 2414 GREENSBORO, N. C.

Dyer, Lauderdale, Weakley and Fayette Counties, Tennessee; and Mississippi, and Craighead Counties, Arkansas. They had been reported previously from Greene and St. Francis Counties, Arkansas, this season. The first record for the State was from St. Francis County in 1959.★★

LISTENING POST

(*From Page* 65)

foliage. In another, however, it was not clear whether spray drift or absorption of the chemical through the roots was responsible. In experiments designed to clarify this point, Zummo and Plakidas found that spotting and defoliation of magnolia plants resulted whether PCNB was sprayed on the foliage or applied to the soil under the plant.★★

Literature Cited

(1) Apt, Walter J., H. M. Austenson, and Wilbur D. Courtney. 1960. Use of herbicides to break the life cycle of the bentgrass nematode, Anguina agrostis (Steinbuck 1799) Filipjev 1936. Plant Disease Reporter 44: 523-526. July.

(2) Cetas, R. C., and Rodney Whidden. 1960. Evaluation of soil fungicides against Fusarium solani isolated from feeder roots of citrus trees. Plant Disease Reporter 44: 465-469. July.

(3) Couch, Houston B., and Laurence D. Moore. 1960. Broad spectrum fungicides tested for control of melting-out of Kentucky bluegrass and Sclerotinia dollar spot of Seaside bentgrass. Plant Disease Reporter 44: 506-509. July.

(4) Neal, D. C., and J. B. Sinclair. 1960. Nitrogen supplement in the Louisiana-Mississippi River delta as a possible control for Verticillium wilt of cotton. Plant Disease Reporter 44: 478. July.

(5) Sinclair, J. B. 1960. Reaction of Rhizoctonia solani isolates to certain chemicals. Plant Disease Reporter 44: 474-477. July.

(6) Zummo, Natale, and A. G. Plakidas. 1960. Toxicity of PCNB to Magnolia fuscata. Plant Disease Reporter 44: 559. July.

FERTILIZER VIEWS

(*From Page* 51)

sical phenomena are tempted to simplify and to use analogies familiar to the hearer. But, like the barrel with the staves of unequal length used to explain the limiting factor in soil fertility, the oversimplified analogy is remembered and in time becomes the accepted truth. It may take some time to correct the fallacy that water-soluble phosphates remain indefinitely soluble in the soil solutions.★★

CONSUMER MARKETING

(*From Page* 41)

Looking to the future, however, a growing sales outlet may be the variety store, since an increasing number of these stores are putting in complete garden product departments.

Sales aids to the retailer include such general items as display cases, cooperative advertising programs, and product literature. Union Carbide's promotion on "Eveready" garden products over the past two seasons also has included a tomato growing contest, motion displayers, and a full color pest chart identifying garden insects and plant disease symptoms.

J. E. Pollard, new product planning manager, points out that in this "Do it yourself era," it is essential that advertising programs and campaigns be directed toward promoting a brand name. The self service trend of consumer shopping requires that labeling on containers be explanatory, yet simple. Thus, Carbide's advertising promotes the "Eveready" name, promises "easy productive gardening," delicious vegetables, and beautiful flowers, listing simple directions as printed on the Eveready products.

A study of shopping habits in a super market, shows that a customer takes only about seven seconds to decide on which product of a competitive group to buy. This, obviously, is far from enough time to reach an informed opinion, or read promotional copy on a package. An attractive package, in which brand name and product-use are readily seen, has the best

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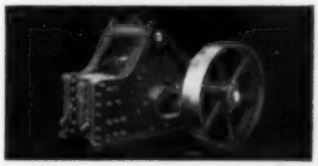
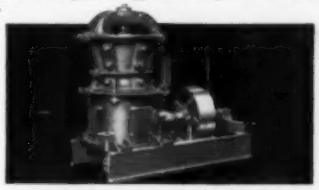
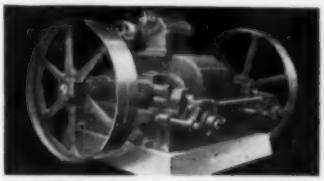


Jaw Crushers — Produce coarse (5 in. largest model) to fine (⅛ in. smallest model). Eight models range from 2 x 6 in. jaw opening (lab model) to 12 x 26 in. Capacities to 30 tph. All except two smallest sizes operate on double cam principle — crush double per energy unit. *Request Bulletin No. 062.*



Rotary Fine Crusher — Reduce soft to medium hard 3 to 8 in. material down to ¼ to 1¼ in. sizes. Capacities up to 30 tph. Smallest model has 6 x 18 in. hopper opening; largest, 10 x 30 in. Non-clogging operation. Single handwheel regulates size. *Request Bulletin No. 063.*



Crushing Rolls — Reduce soft to hard 2 in. and smaller materials to from 12 to 20 mesh with minimum fines. Eight sizes, with rolls from 8 x 5 in. to 38 x 20 in.; rates to 87 tph. Three types — Balanced Rolls; Plain Balanced Rolls; Laboratory Rolls — all may be adjusted in operation. *Request Bulletin No. 065.*

Hammer Mills — Reduce to 20 mesh. Swing-Sledge Mills crush or shred medium hard material up to 70 tph. Hinged-Hammer Pulverizers crush or shred softer material at rates up to 30 tph. Four Swing-Sledge Mills with feed openings from 6 x 5 in. to 20 x 30½ in. Four Hinged-Hammer Pulverizers with feed openings from 12 x 12 in. to 12½ x 24 in. *Request Bulletin No. 084.*

**Reports Manager W. Carleton Merrill concerning Sturtevant Swing-Sledge Mill at James F. Morse Co., Boston.*

STURTEVANT
MILL COMPANY
123 Clayton St., Boston 22, Mass.

chance of "being picked up and put into the shopping basket." Package appeal is essential for the initial sale; then effective performance takes over as the criterion for re-sale.

The original twelve products in the Eveready home garden line have grown to fourteen, consisting today of the "Eveready":

Home & Garden Insect Killer (aerosol)
contains pyrethrins, methoxychlor and piperonyl butoxide

Multipurpose Garden Spray
contains lindane, malathion and methoxychlor

Lawn Weed Killer
contains 2,4-D and 2,4,5-T esters

Kills All Total Weed Killer
contains sodium arsenite

Rose Spray (aerosol)
contains pyrethrins, piperonyl butoxide, rotenone, karathane and captan

Rose Dust
contains malathion, captan, karathane and sulfur

Crab Grass Preventive and Lawn Insect Killer
contains 72% chlordane concentrate

Crab Grass Killer, a selective herbicide
contains ammonium methyl arsonates

Dormant and Summer Oil Spray
contains refined petroleum distillates

Vegetable Dust
contains pyrethrins, rotenone, zineb and sulphur

Floral Dust
contains malathion, DDT, captan and sulfur

Tomato Dust
contains pyrethrins, rotenone, captan, zineb and sulfur

Fruit Tree Spray
contains malathion, methoxychlor and captan

6% Chlordane Ant Killer

This group of fourteen, according to Carbide's staff, could meet 85% of consumer requirements, "nationally speaking," for home garden pests. The formulae are checked regularly, and change with product requirements, regional needs,—or as more effective pesticides for specific applications are discovered. The formulas are approved in Union Carbide facilities, within corporation laboratories, and through Carbide scientists. The products are manufactured by custom fillers or formulators, using Carbide formulae under Carbide's supervision. Carbide technicians and scientists also work with research and technical departments of many other insecticide manufacturers,—such as Geigy, Stauffer, Velsicol, American Cyanamid, and Rohm & Haas, for technical improvement of the pesticide formulations. Grants-in-aid to various experiment stations foot the bill for outside-company product testing and evaluation.

Just how big is the home garden market and what is its future? It is recognized or thought to be a money maker, – and estimates vary from $100 to $150 million at the manufacturer's selling price for garden pesticides alone. However it's evaluated, it is certainly big . . . and growing!★★

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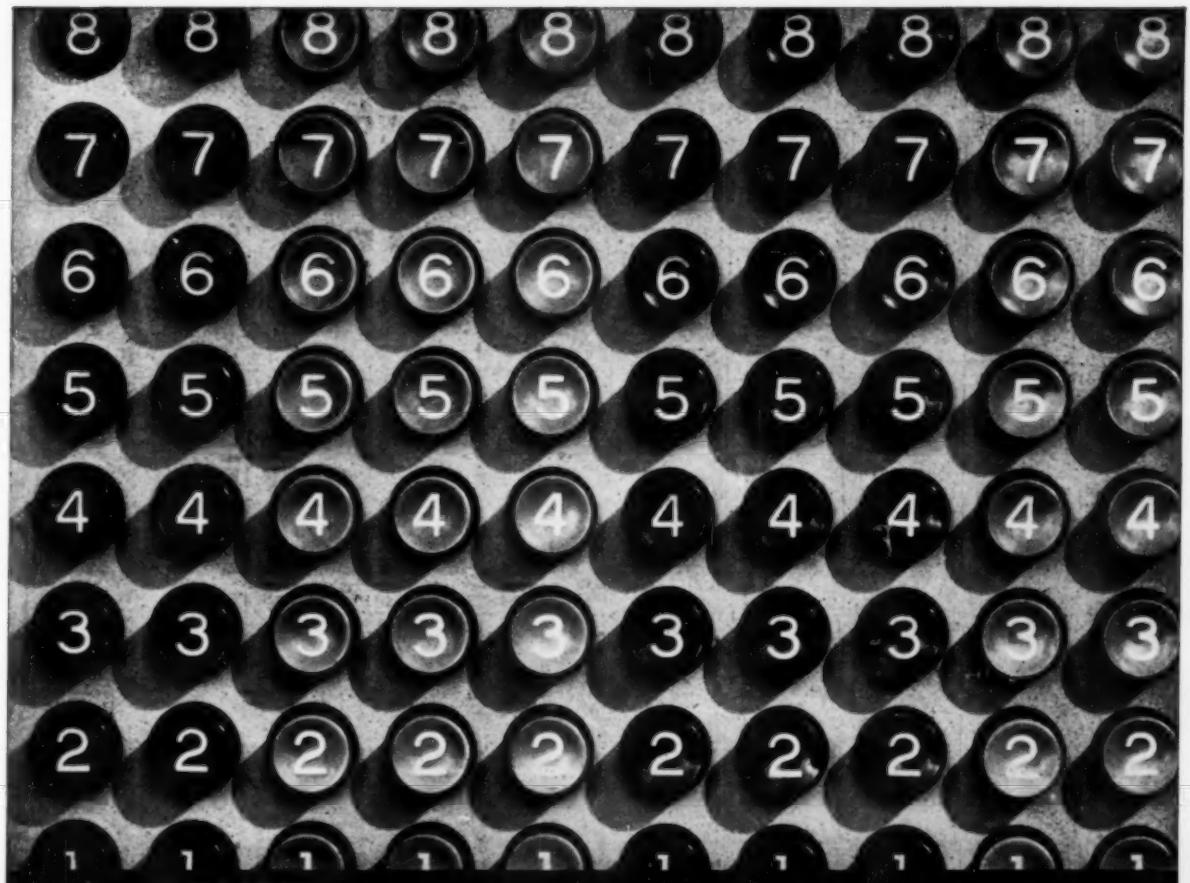
BRITISH ASSOCIATION

(*From Page 39*)

ing arose from the Association's staunch opposition to pressure from the National Farmers Union for a Bill on the lines of the Fertilizer and Feedingstuffs Act, to control the sale of insecticides. In 1931 the Union and the Ministry of Agriculture, agreed instead, to the Association's counter-proposals, whereby manufacturers undertook to guarantee that their products would conform to specifications issued by the Ministry.

The friendly co-operation thus established between the government and the Association led to the



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Crop Protection Products Approval Scheme of 1942. By then the increasing variety and complexity of new insecticides and fungicides was creating difficulties. Farmers and growers needed guidance on how to choose and apply the new materials. Advisory officers were faced with the problem of recommending suitable products while preserving the freedom from commercial bias appropriate to their official standing. The Scheme neatly reconciles these conflicting needs by providing a committee of independent scientists who consider the merits of each new product submitted voluntarily, by manufacturers, and recommend it for inclusion in the official list, published annually about the efficiency of new products.

From the earliest days of chemical crop protection, there have been products which besides being lethal to weeds, pests and plant diseases, may also be dangerous to human beings, livestock and lesser but nevertheless useful, forms of life. In this respect, of course, there is ample legislation in Great Britain to safeguard producers and users against any toxic hazards that might be associated with agricultural chemicals.

ABMAC, despite its admirable record, is not resting on its laurels. There is a feeling in the industry that the present system for approving new products could be bettered. The establishment of an independent government sponsored testing station would simplify and speed up the process of approval, also command a wider recognition for products of manifestly proven worth. Such an internationally recognised certificate of merit awarded by an official testing station would be a definite advantage to British agricultural chemical products competing in overseas markets. As the pace of new development continues to accelerate, it seems inevitable that modifications must come. Another subject of future importance is the possibility of unifying within Europe the present diverse legislation governing the sale and use of pesticides. This is being discussed with European manufacturers. Clearly, there is nothing hidebound in ABMAC's outlook. Backed by an enviable record and well equipped both scientifically and technologically, the industry which ABMAC represents faces the challenge of the future with confidence.★★

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LIVESTOCK RESEARCH

(*From Page* 35)

other organophosphorus materials may soon receive label approval. Pyrethrins and synergists for smears probably will receive label approval and should be safe and effective for face fly control. Preliminary work with insecticide dusts rubbed onto the face shows that they may offer some promise of control.

Special Problems of Resistance and Residues

THE two major troubles facing the entire livestock industry and the food-consuming public are resistance to insecticides and the threat of residues in meat and milk following their use on livestock or forage crops. Insect resistance to modern insecticides was first evident in the house fly, a bothersome and filthy disease-carrying insect, in about 1947. It soon became almost immune to DDT and similar materials. Different kinds of mosquitoes in many places over the world became difficult to control with the modern insecticides. Cockroaches, fleas, and some ticks also became resistant. Last fall, the first authentic record of resistance in cattle lice to DDT and lindane was noted in Virginia. Sheep and goat lice in Texas are reported to be much more difficult to control now than formerly.

We are very fortunate that other flies and most species of ticks have not yet shown resistance. How long currently recommended insecticides will remain effective against these pests is a matter of conjec-

ture, however. To combat resistance, researchers in industry as well as in Federal and State institutions must spend months or years in developing safe and effective substitute materials. The cost and the extra work hinder both the development of new approaches to insect control and the determination of the nature of resistance, so that effective counter-measures can be devised.

Residues have been a difficult problem for several years. It is well known that most of the insecticides used during the last 15 years tended to appear in milk or animal tissues, particularly in the fat. Very costly research has been directed to this problem, including development of sensitive methods of measuring minute amounts of insecticides stored in plants, meat, milk, and eggs under different usage conditions.

It has been said in some quarters that insecticides have been foisted on the public without adequate study. This is not true, since immense effort and much money have gone into experimental work to determine how insecticides may be used safely. Effort and costs are shared by private industry and state and Federal agencies, but the ultimate cost is borne by the taxpayer and consumer.

In addition to studying residues of established insecticides, entomologists and chemists are continuing the search for new and safer compounds. Many thousands of chemicals are being evaluated each year to determine their effectiveness against the different species of livestock insects. Those showing promise in preliminary tests are further evaluated in field experiments. Entomologists are also investigating ways to minimize residues by developing new application techniques and new formulations of the insecticides. The general public may therefore rest assured that everything possible is being done to solve the residue problem, and to insure a bountiful supply of high-quality, clean meat and milk.★★

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AGRONOMIST — B. S. Degree, married, 32 years old, 7 years in sales of wide range of fertilizers and pesticides desires employment with a future. No geographical location preference. Address Box 296, c/o **Agricultural Chemicals.**

MARKETING SPECIALIST — Age 32, 11 years experience. Three years with major manufacturer of mixed fertilizers and insecticides. Eight years with major basic producer of agricultural chemicals. All experience in marketing area. Wish to change to expanding firm. Minimum salary $10,000 in eastern location, $12,000 in western area. Graduate of agricultural college. Capable of planning and operating sales training program. Experience in the following product groups: mixed fertilizers, formulated insecticides, phosphate materials, nitrogen materials and technical insecticides. Would be especially useful to firm planning vertical expansion. Reply Box 297, c/o **Agricultural Chemicals.**

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GENERAL MANAGER FERTILIZER DIVISION — Single plant. Southeast location. Prefer granulation experience. Reply to Box 298, c/o **Agricultural Chemicals.**

W. L. KLATT has been appointed assistant to the director of agricultural chemical sales for U. S. Borax, Los Angeles.

AC

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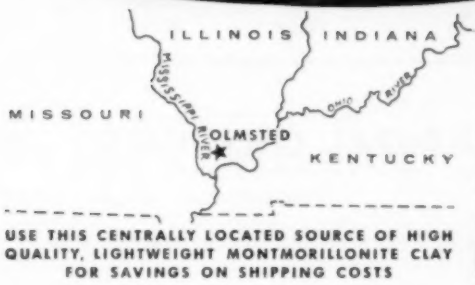

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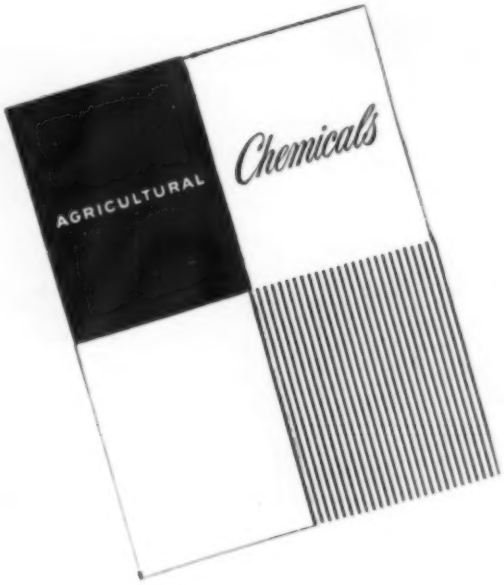

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INDEX TO ADVERTISERS

Allied Chemical Corporation — Nitrogen Division ..... 67 to 70
American Agricultural Chemical Co., The ..... Oct.
American Cyanamid Co. 26
American Potash & Chemical Corp. ..... Oct.

Bagpak Division, International Paper Co. ..... Oct.
Bemis Bro. Bag Co. ..... Oct.
Bio-Search & Development Co. 85
Bradley & Baker ..... Oct.
Bradley Pulverizer Co. ..... Oct.

Chase Bag Co. ..... Oct.
Clark Equipment Co. 18
Clupak, Inc. ..... 3rd Cover
R. D. Cole Mfg. Co. ..... Sept.
Combustion Engineering, Inc., Raymond Division 7
Commercial Solvents Corp. ..... Oct.
Cox, Dr. Alvin 85

Davies Nitrate Co. 61
Davison Chemical Division, W. R. Grace & Co. ..... August

Escambia Chemical Corp. ..... Oct.
Evans Research and Development Corp. 11

Fairfield Chemical Div., Food Machinery & Chemical Corp. ..... Oct.
Ferro Corp. ..... Oct.
Floridin Co. 21
Foxboro Co. 20
Fluid Energy Processing & Equipment Co. 50
Fry Co., Geo. H. 82
Frontier Chemical Co. ..... Oct.

Geigy Agricultural Chemicals ..... Oct.
Glendon Pyrophyllite Co. 80
W. R. Grace & Co., Nitrogen Products Division 4

Hercules Powder Co. 22
Highway Equipment Co. ..... Oct.
Hooker Chemical Corp. 46
Huber Corp., J. M. ..... Oct.

International Minerals & Chemical Corp. 62, 63

Johns-Manville Co. 6

KLM Royal Dutch Airlines 83
Kolker Chemical Corp. ..... Oct.
Kraft Bag Co. 13

Marks & Leeds Co. Ltd. ..... Oct.
McDermott Brothers Co. 77
Minerals & Chemicals Philipp Corp. ..... Oct.

Niagara Chemical Div., Food Machinery & Chemical Corp. ..... Oct.
Nitrogen Division — Allied Chemical Corp. ..... 67 to 70

Penick & Co., S. B. ..... Oct.
Phelps Dodge Refining Corp. 12
Piper Aircraft Corp. 54
Plibrico Co. 16
Potash Company of America 3
Poulsen Co. 23
Prentiss Drug & Chemical Co. 14

Randolph Products Co. 56
Raymond Division, Combustion Engineering, Inc. 7
Reideburg, Theodore Associates 85
Renneburg & Sons Co., Edw. 75
Republic Steel Corp. ..... Oct.
Richardson Scale Co. 24
Rohm & Haas Co. 8

Sauchelli, Vincent 85
St. Regis Paper Co. ..... Sept.
Scientific Associates, Inc. 85
Scott Paper Co. Hollingsworth & Whitney Div. 25
Shepard Division of South American Minerals and Merchandise Corp. 84
Snell, Foster D., Inc. 85
Solkio Chemical Co. ..... Oct.
Signal Oil and Gas Co. Houston Division 17
Southeastern Clay Co. ..... Oct.
Southwest Potash Corp. ..... Sept.
Star Enterprises Inc. 87
Spraying Systems, Inc. 56
Standard Oil Co. (Indiana) ..... Oct.
Stepan Chemical Co. ..... 4th Cover
Sturtevant Mill Corp. 81

Tennessee Corp. 15
Texaco, Inc ..... Oct.
Texas Gulf Sulphur Co. ..... Oct.
Thomas Alabama Kaolin Co. ..... Oct.
Townsend, Dr. G. R. 85

Union Bag-Camp Paper Co. ..... 2nd Cover
Union Carbide Chemicals Co. ..... Oct.
Union Carbide Plastics Co. ..... Oct.
United Heckathorn 86
U. S. Phosphoric Products, Div., Tennessee Corp. 19
United States Borax 9

Vanderbilt Co., R. T. ..... Oct.
Vulcan Steel Container Co. 72

West Virginia Pulp and Paper Co. ..... Oct.
Wisconsin Alumni Research Foundation 85
Witco Chemical Co. ..... Oct.
Dr. Wolf's Agricultural Labs. 85
Woodward & Dickerson 24

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TALE ENDS

NAC's 1960 convention at Coronado, California, held last month, was generally voted the most successful and enjoyable meeting the group has held in several years. General enthusiasm was expressed at the prospect of returning to Coronado in 1963. In '61 the meeting site will be the Homestead in Hot Springs, Va., and in '62 it is planned to return to the Essex and Sussex at Spring Lake, N. J., scene of a long series of NAC' meetings through the forties and early fifties.

AC

The weather at Coronado was perfect, and the hotel proved to be an interesting old museum piece which was worth visiting. Golf, sailing, fishing, and swimming all were available, and none more than five minutes from the door. Then there was always Tijuana or the old Spanish section of San Diego to visit for the incurable tourists like this reporter.

AC

A fishing party engineered by Newt Hall gave twenty participants an opportunity to tangle with the Pacific's sporty, battling yellowtails. The group brought back about a ton of fish,—primarily yellowtails and bonita—the catches being made just a short distance offshore in relatively calm waters.

AC

Visitors from the east also had an opportunity to see Palm Springs, for the Western Agricultural Chemicals Association met there the two days just prior to the Coronado meeting. And although the selection of hotels 150 miles apart for the two closely allied industry meetings involved some added traveling, we wouldn't for anything have missed this opportunity to see the famed California desert paradise resort area, and the brand new, modern, luxurious hotel in which the WACA meeting was held.

AC

An added attraction at the Coronado was the daily aerial display. With a naval air base just a few miles away, there was a constant parade of dozens of odd and unusual types of experimental navy planes, including some prototypes of "flying saucers" overhead at all times.

AC

Highlight of the social side of the NAC meeting was the jam session and cocktail party held in the American Cyanamid suite the first night of the convention. A three man-combo headed by "Tiny" Little, refugee from the Lawrence Welk show, turned out some of the best resounding jazz this writer has heard since the roaring twenties.

AC

A series of letters and pamphlets are reported to have created quite a stir in a California farming area recently. A sample title is "Don't Give Babies Poisoned Milk." The publications were, of course, false and misleading but they reached many thousands of persons before their originator was uncovered and made to stop. Among other things, the pamphlets accused the pesticide industry of "payola" in their dealings with regulatory officials.

AC

W. R. Grace's Davison Chemical Division soon will offer a new type of fertilizer for home and garden use. The product, as yet unnamed, is based on a magnesium, ammonium, phosphate base with potash and trace element compounds added. Of interest to home gardeners will be the product's nonburning feature that will eliminate danger from over application or insufficient watering.

AC

Recent patent developments: Geigy's patent on DDT has expired and Shell has won its patent battle with Ciba for their DDVP patent.

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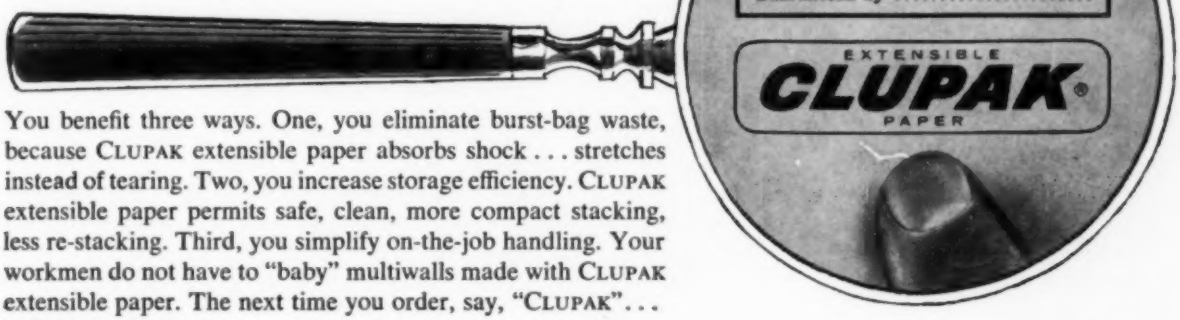

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